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THE JOURNAL OF *Agricultural Economics Research*



United States
Department of
Agriculture

Economic
Research
Service

40th Anniversary Issue

Contents

In This Issue

The Economic Research Service and *The Journal of Agricultural Economics Research*

Forty Years in Retrospect

The Journal of Agricultural Economics Research: Oris V. Wells' Journal Turns 40

Agricultural Economics Research: Some Notes on the New Journal

Japanese Monetary Policies and U.S. Agricultural Exports

Export Responsiveness and U.S. Farm Policy Options for Wheat

Trade Effects of U.S. Commodity Programs

Export Policy, Deficiency Payments, and a Consumption Tax

The Reviewer's Craft

Reflections on Communication in Agricultural Economics

Book Reviews

Mathematical Programming for Economic Analysis in Agriculture

Food Demand Analysis: Implications for Future Consumption

Food in Sub-Saharan Africa

THE JOURNAL OF *Agricultural Economics Research*

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Contents

1 In This Issue

Gene Wunderlich

Anniversary Articles

3 The Economic Research Service and *The Journal of Agricultural Economics Research*

John E. Lee, Jr.

5 Forty Years in Retrospect

Don Paarlberg

7 *The Journal of Agricultural Economics Research*: Oris V. Wells' Journal Turns 40

Rex F. Daly

9 Agricultural Economics Research: Some Notes on the New Journal

O.V. Wells

Research Articles

11 Japanese Monetary Policies and U.S. Agricultural Exports

John B. Penson, Jr., and Ronald A. Babula

19 Export Responsiveness and U.S. Farm Policy Options for Wheat

Larry Salathe

30 Trade Effects of U.S. Commodity Programs

James A. Zellner

Comments

38 Export Policy, Deficiency Payments, and a Consumption Tax

Bruce Gardner

42 The Reviewer's Craft

Judith Latham

47 Reflections on Communication in Agricultural Economics

Harold F. Breimyer

Book Reviews

49 Mathematical Programming for Economic Analysis in Agriculture

Reviewed by Robert M. House

52 Food Demand Analysis: Implications for Future Consumption

Reviewed by Laura Ann Blanciforti

55 Food in Sub-Saharan Africa

Reviewed by Francis Urban

In This Issue

Volume 40 of the Journal begins with this issue.

In the literature of antiquity, the number 40 symbolized a large number, a long period of time, or maturity. We would like to believe that the Journal, as it represents agricultural economics in the U.S. Department of Agriculture, has likewise achieved a measure of maturity.

The 39 volumes published since O.V. Wells launched the Journal include 488 articles and 764 book reviews, over 5,500 pages. The scope of articles has ranged widely from the theoretical and speculative to the empirical and factual. The articles and reviews have reflected the economics not only of USDA but of the profession as a whole. From its history and experience the Journal can claim a respected position in the literature of agricultural economics.

The Journal has been a part of agricultural economics for half the life of the profession. Its quarterly issues have appeared through inflation, depression, and virtually every production, marketing, and financial condition conceivable. The Journal has survived and prospered under a variety of administrations and managements.

But maturity demands more than age and experience. It demands grace and civility, features the Journal has carried almost to a fault. Perhaps as a legacy of Wells' original instruction, the Journal has supported economic reason and measurement, shunned controversial opinions, and rejected opinionated controversies.

Finally, maturity in a Journal means taking its responsibilities, not itself, seriously. Possibly, in its quest for rigor, the Journal has overlooked opportunities for a little fun. With the help of contributors, however, our analytics can be less solemn. After all, it was the results of the economic analysis of his time that Carlyle dubbed "dismal," not the study of economics and its methods.

Leading off this issue are three anniversary articles by veteran agricultural economists writing about the responsibilities of the Journal and the organization it represents. Lee sees social science information as a critical dimension of the mission of the Economic Re-

search Service and the Journal as a vehicle for carrying information not only to decisionmakers but to others in the discipline. In a 40-year sweep of the profession, Paarlberg attributes some of the improved living standards, food supply, and environment to advances in economic literacy and suggests that the Journal had a role. Daly, a former editor, draws on O.V. Wells' admonition to prepare reports so that they are readily accessible to fellow workers and the public. Wells' article inaugurating the Journal is still relevant; we have reprinted it in full.

The research articles in this issue treat price, trade, and monetary policies as elements in analysis. Their research demonstrates service to policy without advocacy. Penson and Babula indicate that exports from the United States may depend more on real than nominal exchange rates, showing that a higher relative value of the yen may actually increase imports of U.S. corn and wheat by Japan. Salathe examines the effect of U.S. domestic wheat programs on farm income, consumer costs, and public expenditures. He eliminates all major alternatives and concludes that reducing program costs necessarily entails reducing income support to wheat farmers. Zellner argues that deficiency payments to support farm income have the effect of export subsidies and that acreage restrictions or loan rates above market prices are equivalent to export taxes. He then concludes that the current programs, in relation to trade, are an export tax, not a subsidy, as is commonly asserted.

Notes and comments have been atypical for the Journal, but in the future we hope that authors will use these short items to extend a previous work, to challenge an article or argument, or to provide useful information of limited scope. Gardner, for example, extends and clarifies an earlier paper on the distributive effects of commodity programs, and he argues for the superiority of a combination of a tax on domestic consumption and a producer subsidy. Latham writes on writing and contends that better book reviews are not only desirable, but possible. And Breimyer holds out the hope that, one day, economists may learn to communicate well.

It is fitting that, in a journal of applied science, Latham's theory of better book reviews be followed with

applications of book reviews. In this issue, House assesses Hazell and Norton's book on mathematical programming and finds it strong on sector modeling generally, but criticizes the emphasis on linear approximations of nonlinear variables. Blanciforti critiques diverse chapters of the book on food demand analysis assembled and edited by Capps and Senauer. She admits many substantial contributions from nearly everybody active in the field, but finds a common failing of anthologies—the absence of synthesizing overview for policymakers. By contrast, Urban is more sanguine about the integration of articles in Hansen and McMillan's compendium on food in Sub-Saharan Africa. He

notes the general deterioration of food and economic conditions during the past 25 years and wonders why the scientific community has attended to the problems of the area so poorly.

The number 3 symbolizes completeness. I noticed that, coincidentally, each of the sections in this issue contains three items. But volume 40 will not be complete until we have three more issues. Meanwhile, we are eager to share the results of the Department's social science research as volume 40 unfolds.

Gene Wunderlich

Best Article Award

The ERS Administrator's Award for the Best Article in the Journal for the period ending September 1987 went to John Kitchen and Mark Denbaly for their article, "Arbitrage Conditions, Interest Rates, and Commodity Prices," which appeared in the Spring 1987 issue.

Anniversary Articles

The Economic Research Service and *The Journal of Agricultural Economics Research*

John E. Lee, Jr.

The 40th anniversary of *The Journal of Agricultural Economics Research* is an appropriate time to reflect on its role in the context of its institutional sponsor, the Economic Research Service (ERS). The Journal, approved as a USDA periodical shortly after the end of World War II, was intended as an outlet for contributions by USDA social scientists and cooperators in the land-grant university system. Thus, the Journal's life spans the development of agricultural economics (and, to a lesser extent, the other social sciences) in the postwar decades.

The Journal provides a vehicle for sharing the intermediate products of ERS research with other social scientists. Its objective is to enhance their capacity to produce more effective information and thereby improve the performance of the rural and agricultural sectors. It does that by contributing to the state of the art in economic theory and methods and by reporting new findings about important economic and social relationships.

The Journal's succession of strong editors has built a legacy of high standards, while winning it growing recognition and respect as a premier vehicle for refereed articles on new developments in research methods and theory, new applications of existing theory, and significant new social science research results.

The Journal thus directly supports the mission of ERS: providing economic and social science information that will improve the public good by bettering the performance of U.S. agriculture and the rural economy. Some of the components of that statement may need elaboration to show more specifically how the Journal's scientifically rigorous style of articles meshes with the ERS mission.

Information Defined Broadly

In the context of the ERS mission statement, economic and social science information includes all data (both raw and processed), short-deadline staff analyses, situation and outlook analyses, results of research (from basic to applied), interpretations of data, and forecasts

pertinent to the needs of decisionmakers. The ERS program includes such a variety of information vehicles, not as ends in themselves, but as different means of improving the rural and agricultural economies. Information also encompasses applications of economic logic, arguments and tests of economic theory, and syntheses of existing research and analyses to fit the needs of decisionmakers.

Information provided by ERS deals primarily with economics, but also draws upon sociology, history, law, and, occasionally, political science and the other social sciences. By integrating economics and the other social sciences, ERS can provide an extra dimension to its information, making it more useful for the full range of considerations decisionmakers take into account.

Providing Information Means More Than Conducting Research

Information is useful only in a context of time, form, quality, and place. Such dimensions vary with the context within which the information is used. Timeliness has one meaning in the context of the articles in the Journal and quite another in the context of short-term staff analyses.

Information published in the Journal tends to be of a "capacity-building" nature. That is, the articles focus on development of improved theory, research methods, and enhanced analytical frameworks. They represent an intermediate step toward improved decisionmaking.

The utility of such information is no less important than for short-term staff work. It is simply different. In every case, information must be timely, relevant to the needs of users, and in the form most useful to the audience.

Information must, of course, be accurate, but the degree of accuracy varies with the needs of specific decisionmakers. For some, quantitative accuracy in great detail is most useful. Others may want only the basic directions and orders of magnitude.

The author is the administrator of ERS.

Much good research and analysis are wasted because the results are not clearly communicated and are, therefore, misunderstood or misused. Much of the "comment and response" in professional literature represents such miscommunication rather than substantive disagreement. Lack of clarity in communicating is costly in terms of both wasted resources and reduced effectiveness.

"Providing information" means doing more than conducting research and analyses and generating data. It means interpreting and reporting the results of research to make those results useful. It means not only providing information with the most useful time, place, form, and quality characteristics, but also helping others understand, interpret, and use it. Because users of ERS information range from decisionmakers to economists to public policymakers, ERS distills its information into a variety of forms to reach those varied audiences. The Journal is one such vehicle. Through other vehicles ERS helps extension agents and others engaged in providing public policy education and in advising farmers, agribusinesses, and rural leaders.

Performance As It Relates to Achieving Society's Goals

The performance of the food and fiber system is measured in terms of society's objectives, which include such factors as efficient use of resources, financial well-being of people and industries, fair and equitable distribution of costs and benefits, and human health and safety. Thus, "improved performance" is more than narrow technical efficiency. It encompasses a broader purpose for U.S. agriculture and the rural economy.

Implicit in the ERS mission statement is the assumption that system performance is enhanced if we help individuals—consumers, farmers, agribusinesses, and public policymakers—make more informed choices.

Strategy for Achieving ERS Mission

Because it is difficult to predict the precise information needs of decisionmakers, ERS has chosen, as a strategy for achieving its mission, the development of a "capacity to respond" to specific needs as they arise. Development of such capacity means: anticipating broad subject matter areas likely to be important; developing "capital" in the form of enhanced databases, human expertise, and accumulated research results; and developing analytical frameworks (formal and conceptual models as well as enhanced theory and research methods) to apply the "capital" to the information delivery systems.

The decisionmakers to whom ERS information is addressed include both the public officials who set the policy environment and the private decisionmakers. Public officials require information to understand and monitor economic and social phenomena, to formulate public policies with full knowledge of the consequences of alternative courses of action, and to manage programs to achieve policy objectives. Private citizens need similar information to make informed decisions in the economic arena. They also need access to market information and analyses and to other information with "public good" characteristics. ERS provides such information to widen the opportunities for participants in agricultural and rural markets through vehicles like the Journal.

Rural social science researchers and analysts outside ERS are not our clients as is often stated or implied; they are fellow laborers in the vineyard. We all have the ultimate objective of improving the understanding of economic and social relationships and thereby contributing to more effective public and private decisionmaking. As a significant part of the social science community, ERS has a responsibility to contribute to the state of the art in economic theory and methods and to share new findings about important economic and social relationships so as to enhance the capacity of the profession at large. The Journal is a major vehicle for that sharing.

Forty Years in Retrospect

Don Paarlberg

Congratulations to *The Journal of Agricultural Economics Research* on 40 years of productive life. May there be many more.

Forty years ago, when the Journal was launched, O.V. Wells laid down its format. It would, he said, carry signed articles in three fields:

- Results or findings of research carried forward in the Bureau of Agricultural Economics,
- Articles on new research methods or techniques, and
- Articles on statistical fact-gathering.

A review of works published in the Journal reveals that the format Wells laid down has been followed with remarkable faithfulness. The subjects cover almost the entire area relating to agriculture. Often these articles come early in the cycle of public concern focused on them.

Recognizing that a listing is arbitrary and that it must overlook many worthy authors and subjects, I report some of the topics and writers featured during the life of the Journal. The timing of the articles reflects growth and change in the agricultural economics discipline.

Sampling. The work of Earl Houseman and Charles Sarle pioneered improved accuracy and credibility of estimates by what has become the National Agricultural Statistics Service. These men were instrumental in transforming the statistical work of the Department of Agriculture from undisciplined fact-gathering to a probability sampling. In a recent issue, Barry Ford, Jack Nealon, and Robert Tortora addressed a long-neglected subject: nonsampling errors.

Statistical Method. Among the prestigious names were Fred Waugh, Marc Nerlove, and Karl Fox.

Soil Conservation. George Walter reported early original work on soil conservation. Henry Wallace reviewed a book on the care of the earth in 1963.

Water Use. Raymond Anderson foresaw increasing non-irrigational demands for water in 1963.

History. O.V. Wells reviewed the history of agricultural economics in 1953.

Macroeconomics. Karl Fox and Harry Norcross addressed the subject in 1952. Clark Edwards has written repeatedly on various aspects of the macro field.

Structure. Allen Paul wrote on the agribusiness side of farm structure. Radoje Nikolitch reported the onfarm side, as did Warren Bailey.

Food. Fred Waugh, Marguerite Burk, Howard Davis, William Boehm, Sylvia Lane, Stephen Hiemstra, and others were in print on this subject. Some of them wrote before food policy issues were high on the public policy agenda.

Economics of Individual Farm Products. Harold Breimyer published prominently on livestock subjects. Gerald Dean, S.S. Johnson, and Harold Carter reported on the supply function for cotton.

Demographics. Calvin Beale pioneered in this field.

Econometrics. Martin Abel published on econometrics in 1963. Virtually an entire issue in 1978 was devoted to computerized data systems in the U.S. Department of Agriculture.

Productivity. Raymond Christensen and Harold Yee wrote on agricultural productivity before it gained widespread interest.

Agricultural Development Abroad. Sherman Johnson wrote early and repeatedly on foreign development. D. Gale Johnson published on it in 1977.

Trade. The Journal has published numerous articles on trade. Alex McCalla wrote on it 10 years ago.

Technology. Robert Nevel wrote on technology in 1969, and the subject permeates many other articles.

The author is professor emeritus, Department of Agricultural Economics, Purdue University.

Biotechnology. Susan Offutt and Fred Kuchler have a thoughtful article on biotechnology in the winter 1987 issue.

Other prominent economists have written for the Journal, some of them on general subjects, some in book reviews: George Brandow, who did work of lasting value on supply and demand curves; Ray Bressler, noted for his contribution in the marketing area; Earl Butz, President Nixon's Secretary of Agriculture; Willard Cochrane, former Director of Agricultural Economics; Bruce Gardner, currently productive in the field of farm policy; Dale Hathaway, now prominent in international agricultural matters; Earl Heady, recipient of more prestigious awards than any other agricultural economist; Glenn Johnson, Fellow of the American Association of Agricultural Economics; Charles Kellogg, a leading soil scientist with special interest in economics; J.B. Penn, prominent agricultural consultant in the Washington area; John Schnittker, former Undersecretary of Agriculture; Ed Schuh, top agricultural economist with the World Bank; Ted Schultz, holder of the Nobel Prize for his work in agricultural development; Lauren Soth, dean of agricultural writers; and Luther Tweeten, former president of the American Association of Agricultural Economics. The listing reads like an honor roll of the profession.

The Journal has been able to attract good authors throughout its history. Its articles have been professionally worthy. They supplement and anticipate more complete studies appearing in special reports and bulletins. Accountability and relevance are two special attributes of the Journal.

The writing style is professional without being esoteric. It is intended more to enlighten the reader than to advance the prestige of the writer, a commendable policy that unfortunately is not widespread among agricultural economists. Esther Colvin and Ronald Mighell offered some good counsel on the subject in 1957.

Not prominent among articles featured in the Journal are these subjects: farm labor, land tenure, rural development, and commodity programs, the latter probably because O.V. Wells said flatly that "articles dealing directly with agricultural policy will not be included."

Nevertheless the Journal has treated various controversial subjects on the public policy agenda during the past 20 years: food issues, environmental questions, demographic changes, structural matters, and issues emerging from the new biology. At the same time, the editors have been sufficiently circumspect to hold in check style

and subjects that would jeopardize the continued existence of the Journal and the agency. Doing and reporting economic research in a political environment is a precarious undertaking. The Journal keeps probing to find out where the limits are. As these limits change, the Journal changes. When the limits are found, they are respected.

What has come from all this effort? Measurement is impossible, but perceptions are admissible. New knowledge has been more widely disseminated. Public understanding has been advanced.

Professionals in the Department, having the Journal as an outlet for their research, have been buoyed in spirit and stimulated to be more productive.

The reputation of both the Department and the Economic Research Service has been enhanced. The proud tradition of the old Bureau of Agricultural Economics has been sustained.

During the 40 years of the Journal's existence, the standard of living on America's farms has risen, the nutritive quality and wholesomeness of the food supply have improved, and the country has been alerted to the importance of environmental issues. A part of the improvement must come from an advance in economic literacy, and a part of that advance must be attributed to the work of the Journal.

In my opinion, commodity policy is the one area in which we have not advanced. The Journal has given increasing space to this subject in recent years, but few people seem to be listening.

Research is not only a matter of professional endeavor, but it is also an act of faith. One must have faith that his or her work, at least in the long run, will add to the sum of human knowledge, will be perceived by the public, and will lift the general level of well-being.

Over the entry to Warren Hall at Cornell University are these lines:

Never yet share of truth was vainly set
In the world's wide fallow.
After hands shall sow the seed.
After hands from hill and mead
Reap the harvest yellow.

Belief in the ultimate social and economic value of their work is what sustains researchers. And publication is what exposes their discoveries to a needful hazard: the refining fires kindled by others.

The Journal of Agricultural Economics Research: **Oris V. Wells' Journal Turns 40**

Rex F. Daly

The Journal of Agricultural Economics Research was started in 1949 by Oris V. Wells who had become Director of the U.S. Department of Agriculture's (USDA) Bureau of Agricultural Economics (BAE) in 1946. The Journal was to serve the BAE staff as a medium "for the publication of technical articles."

Wells was a farm boy who in 1929 came to the BAE as a junior economist shortly after graduation from New Mexico's College of Agriculture. He moved up rapidly in BAE, from a successful technician into supervisory and administrative assignments, advancing to the top of the civil service ladder. With his shift to the new Agricultural Adjustment Administration in the midthirties, and throughout the rest of his career, Wells became heavily involved in agricultural policy issues.

I am sure that history will judge Oris Wells as one of USDA's giants and a leader in the development and analysis of U.S. agricultural policy. He was a voracious reader and a good technical economist with the memory of an elephant for economic situations and facts. He was a most perceptive and politically astute analyst of the politics of economics as well as an effective and much sought-after speaker. These skills and his broad grasp of the underlying facts made him a master at cutting through the verbiage to important problems and in getting understanding and agreement on these problems.

Wells served as an economic and policy adviser to Secretaries of Agriculture and to representatives of agriculture in the U.S. Congress for more than a quarter century. In my judgment, he was the ablest and strongest administrator to pass through USDA during my tenure there. I believe that most of his peers would agree.

Wells' guidance on journal policy and on the articles published has transcended developments in the agricultural economics discipline; for example, farm-nonfarm trends and the role of agriculture, education and train-

ing, and international development. He had a major influence on the Journal in his time, which is reflected in the way we communicate today. Even though the Journal has survived many changes in the administration of economic research, its general objectives and editorial policy continue much along the lines he originally suggested.

Its articles still cover progress and findings in research and new methods and techniques, but there have been changes. It is interesting that Wells thought the State Statisticians and members of their staffs should be a major source of articles on research methods and techniques. He was also firm in excluding articles dealing directly with agricultural policy.

The scope of agricultural economics, in Wells' view, included the entire fields of agricultural estimates and statistics, rural social studies, and research on prices, marketing, land economics, farm finance, and farm management. His price analysis research undoubtedly included demand analyses, food demand and consumption studies, and perhaps even commodity analysis systems. Farm management activities would probably include research on the production response in agriculture. But would the discipline have anticipated farm management born again as farming systems research?

As the Nation becomes largely urban, few graduates in agricultural economics have first-hand knowledge of the increasingly complex agricultural industry. Moreover, with rapid developments in technology, even the experienced researcher can quickly become illiterate about the practical and institutional developments in agriculture. As a result, researchers often feel more comfortable with methodology and techniques, and they may get more professional points for such articles than for those that offer practical applications of research results to problems, address policy issues, or provide outlook assessments for agriculture.

In economic development activities, one finds that recent graduates (whether trained in general economics or in agricultural economics) know little about agriculture and its role in the economies of developing nations. In

The author was formerly director of the Economic and Statistical Analysis Division, ERS, and chairman of the Outlook and Situation Board, USDA. He was also editor of *Agricultural Economics Research* from 1960 to 1965.

such nations, it is usually the general economist who deals with macroeconomic policy and with issues relating to development. However, economists who do not have experience and agricultural training do not understand that the so-called macroeconomic problems usually originate in agriculture. This knowledge/experience gap creates problems in the programs of donor agencies and in planning for agricultural development, and it limits the effectiveness of our advice to policymakers.

As Wells reminded members of the Journal staff, "agricultural economics work is carried on in the public interest and every researcher or statistician, regardless of his field, does have a responsibility for seeing that his material is prepared in such a way as to be readily accessible to his fellow workers and the public." I think Wells' life work suggests he also meant that research must be readily understood and relevant to public problems and policy issues.

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AGRICULTURAL ECONOMICS RESEARCH

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Volume 1

JANUARY 1949

Number 1

Agricultural Economics Research: Some Notes on the New Journal

By O. V. Wells

SOME OF US have felt for a long time that the Bureau of Agricultural Economics needed some medium for the publication of technical articles. Surely such a journal should prove as useful to agricultural economists and statisticians as similar journals have proved in other fields, such as commerce, labor, or for general agriculture, the *Journal of Agricultural Research*.

We intend that this be such a journal.

Editorial policy has not as yet necessarily crystallized. However, some tentative rules were suggested in a memorandum circulated to the field employees of the BAE under date of November 8. This memorandum indicated that we expect the journal to carry signed articles of 5,000 words or less falling within any of three general fields:

First, and most important from the viewpoint of space, we will publish articles that report on the results or findings of research carried forward within the Bureau. These articles may be in the nature of interim reports on work in progress or, on occasion, statements that actually terminate the project. Partly because of limited printing funds and partly because of the time consumed in preparation, the bulletins through which we publish many of our research findings are delayed. This new journal should be of service in speeding up the dissemination of our technical findings. Almost every leading line of work within the Bureau should turn up some new or significant result which would warrant consideration of an article from time to time.

Second, we will publish articles on new research methods or techniques that are being developed, as well as critical discussions of old techniques that are in regular use. As the reading audience will be primarily professional, we shall occasionally publish articles on methods or techniques which are designed to elicit or encourage discussion at the technical level.

Third, we will publish articles on new or expanding areas of research or statistical fact-gathering. Over and above any discussions of techniques that these articles may include, they should cover the probable usefulness of such new developments as well as the place of such new areas of work in the agricultural field.

Although all Bureau representatives are invited to submit articles in any of these three fields, we believe that State statisticians and members of their staffs should be an especially fruitful source for items falling within the second general field. We are continuously engaged in studying ways and means of improving the usefulness and reliability of the data collected through Agricultural Estimates. A considerable number of our inquiries and their results in this field often remain relatively unknown, especially to individuals outside the Service. Since the information collected and published as a result of our statistical work is so widely used, it is desirable to acquaint agricultural economists and statisticians generally with any improvements. Each issue of this journal should carry a couple of articles of this kind.

As we are anxious to carry discussions relating to all the work for which we are responsible, we shall consider articles from workers who are co-operating, or working under contract, with the Bureau. Such articles can be written jointly by a member of the Bureau and the cooperating or contracting individuals in the other organizations or over the signature of some single individual, who may be an employee either of the Bureau or the other agency—e. g., a State Agricultural College.

A few book reviews will be carried, with especial attention to books which deal with research or statistical methods or to books falling within the more general social science fields where the conclusions or recommendations are chiefly based upon agricultural economics research. In addition, the editors will include in each issue a selected list of the more recent research and statistical releases of the Bureau which seem most significant, together with a series of short notes indicating the nature or content of each item.

Some of the questions that may be raised with respect to this new publication need to be considered.

Questions may be raised with respect to coverage. We have already indicated the type of articles believed to be appropriate, but it is perhaps worth saying that this journal is not designed to compete either with the *Journal of Agricultural Research*, which offers workers in the natural sciences a medium for articles, or the field covered by professional journals such as the *Journal of Farm Economics*. Articles dealing directly with agricultural policy will not be included. Articles in this field originating within the Bureau are expressions of personal opinion rather than official statements and are usually so designated. Such articles as a rule should be offered to some outside professional journal.

Some question may be raised with respect to cost. As best we can estimate, the annual cost of the journal will be about equivalent to the cost of publishing one fair-sized technical bulletin. But

the journal should offer a medium of publication for several workers in each issue whereas the technical bulletin as a rule serves as a means of publishing the results of one project. *Agricultural Economics Research* can be so used as to economize printing funds as well as to allow the more prompt publication of technical material.

A question may be raised with respect to the definition of the term, agricultural economics research. The term is here used in its widest sense to cover all work ordinarily carried forward by the Bureau, including work done in cooperation with other agencies such as State Agricultural Colleges and State Departments of Agriculture. That is, we consider agricultural economics to cover specifically the entire field of agricultural estimates or statistics, of rural social studies, and of research on such subjects as prices, marketing, land economics, farm finance, and farm management.

Finally, there is a fourth question that is almost inevitable—the question as to where and how workers in the Bureau will find time to write articles. However, in many instances there is need for at least a progress report well before a study is wholly completed. We believe that there is good reason why a considerable amount of such work should be published in a permanent journal rather than in mimeographed form, especially as mimeographed releases are always difficult to find once immediate interest in the subject has subsided. As a matter of fact, there are several excellent reasons why researchers and statisticians within the Bureau generally should give more rather than less time to bringing their material into some organized written form. After all, *agricultural economics work is carried on in the public interest and every researcher or statistician, regardless of his field, does have a responsibility for seeing that his material is prepared in such a way as to be readily accessible to his fellow workers and to the public.* We hope that this new journal will assist us to this end.

Research Articles

Japanese Monetary Policies and U.S. Agricultural Exports

John B. Penson, Jr., and Ronald A. Babula

Abstract. Accelerated Japanese monetary expansion failed to appreciably influence imports of U.S. crops despite notable increases in the nominal yen/dollar exchange rate, according to COMGEM, a U.S. macroeconomic model that incorporates non-U.S. macroeconomic linkages and an Armington model of foreign demands for U.S. crops. Expansionary monetary policies also led to higher Japanese inflation and raised real national income, offsetting the negative import effects of higher nominal exchange rates. COMGEM simulated three 1986–90 Japanese monetary expansion rates, given unchanged U.S. macroeconomic patterns, to determine the influences of Japanese monetary shocks on imports of U.S. crops.

Keywords: Macroeconomic linkages, U.S. corn and wheat exports to Japan, Armington theory, policy transmission mechanisms, purchasing power parity, Japanese inflation and real national income, yen/dollar exchange rates.

The agricultural trade literature is replete with studies examining the effect of foreign exchange rates on exports of U.S. agricultural commodities. Schuh's often-cited article on the growing importance of exchange rates to U.S. agriculture has stimulated econometric interest in this area for more than a decade (24).¹ Reviews of literature by Schuh (25) and Thompson (28) point to many contributions by agricultural economists to quantifying the effects of exchange rates on U.S. agricultural exports. More recent efforts by Batten and Belongia among others have added significantly to this literature (4, 5). Chambers (8) and Chambers and Just (9) have argued that exchange rate effects should be evaluated in a general equilibrium context, and Reinhart (23) has suggested that foreign economic growth does matter.

Little has been done, however, to link the effects of foreign monetary policies to U.S. agricultural exports.

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¹ Italicized numbers in parentheses refer to items in the References at the end of this article.

The Federal Reserve has tried for several years to urge Japan and our other major trading partners to adopt expansionary monetary policies to stabilize the balance of trade. Whether the adoption of expansionary monetary policies of our major trading partners would improve economic conditions in U.S. agriculture is of considerable interest to U.S. farmers and policymakers.

We have two objectives in this article. The first objective is to econometrically estimate trade flow equations for Japanese imports of U.S. corn and wheat. The import demand equations are based on Armington demand theory, which reflects the two-stage import decision procedure without departing from Hicksian demand theory. The second objective is to use the Japanese import demand equations with other equations that capture the linkage between Japanese monetary policy and import demand to determine how expansionary Japanese monetary policies affect projected Japanese imports of U.S. corn and wheat.

We summarize the assumptions and structure of Armington's theory of import demand for commodity consignments differentiated by kind and by origin. We discuss the specification and estimation of a model of Japanese import demand for U.S. wheat and corn and then present out-of-sample validation results for these estimated equations. Finally, we examine the effect of selected monetary policies on Japanese imports of U.S. wheat and corn.

Armington Model of Import Demand

A major criticism of U.S. agricultural trade models is that they frequently focus on total U.S. exports of a particular commodity to an aggregate rest-of-the-world sector (28). One approach to relaxing this assumption is the multiregion structure of international demand developed by Armington that differentiates commodities by kind and by origin (1, 2). Evidence suggests that a commodity's supplies from different exporting nations are seldom viewed by importing nations as perfect substitutes (2, 17). Sources of differentiation can include political alliances, actual quality differences, and degree of procurement risk (14, 28). A good or market in Armington's terminology represents a commodity (for

example, wheat), whereas a product is a good differentiated by kind and origin (for example, U.S. versus Canadian wheat).

Armington demand theory rests on three assumptions. First, the preferences of an importing nation's consumers are assumed to be homogeneously separable. Second, elasticities of substitution in the importing nation are constant. Third, there is a common elasticity of substitution for all product pairs within a particular market. These three assumptions together imply homogeneously separable, constant elasticity-of-substitution utility functions for importing nations. These assumptions further suggest that consumers in the importing nations follow a two-stage budget procedure (13). We assume here that consumers in Japan initially maximize their utility subject to a budget constraint. Japanese consumers are then assumed to minimize their expenditures in each market (wheat and corn) subject to their first-stage market demand (2).

The structure of the Armington demand model is summarized in equations 1 and 3. The first equation represents a Marshallian market demand for the i th good that results from maximizing the importing consumers' utility subject to an income constraint. The third equation represents a Hicksian demand for the i th good supplied by the j th exporting nation subject to the level of stage-one market demand.²

$$x_i = h^i(\text{RLY}, p_1, \dots, p_i, \dots, p_n) \quad (1)$$

$$x_{ij} = g^{ij}(x_i, p_{i1}, \dots, p_{ij}, \dots, p_{im}) \quad (2)$$

which can be restated as follows:

$$x_{ij} = b_{ij}^{oi} x_i (p_{ij}/p_i)^{-oi} \quad (3)$$

where $i = 1, \dots, n$ and $j = 1, \dots, m$ and where n represents the number of goods, m represents the number of exporting regions, x_i is the quantity index of the i th good demanded from all sources (that is, the first-stage demand), h^i is the first-stage Marshallian demand for the i th good, RLY is the importing nation's real national income, x_{ij} is the second-stage demand for the i th good supplied by the j th exporting nation, g^{ij} is the second-stage Hicksian demand for the ij th product, p_i is the index of m number of real export prices for the i th good expressed in the importing nation's currency, p_{ij} is the real export price for the i th commodity supplied by the j th exporting nation, b_{ij} is a constant demand parameter associated with the demand for the ij th product, and oi is the importing nation's constant elasticity of substitution associated with each product pair in the i th market.

Armington's justification for limiting the number of utility function arguments through aggregation enhances econometric estimation by requiring a smaller number of variables (21). Philips demonstrates that, under conditions of weak separability implied by Armington models, one can estimate product demands using only the product's market price and constraint data as opposed to such parameters of the entire consumption set (21). Eliminating these collinear arguments mitigates problems of multicollinearity.

Country-specific variables may be added to equations 1 and 3 since Armington developed his general theory to capture any importing nation's demand for any particular product. We developed ancillary equations capturing the linkage between Japan's monetary policy and selected macroeconomic variables in the general economy that affect Japan's import demand.

Data and Choice of Estimator

The trade flow and price data used here to measure the quantities demanded in the first- and second-stage demand equations for Japanese imports of wheat were obtained from *World Wheat Statistics* published by the International Wheat Council (16). Similar data for corn were provided by the U.S. Department of Agriculture's Foreign Agricultural Service (29). Quantities in each instance are expressed in 1,000 metric tons. The price data for these and other commodities were obtained from *International Financial Statistics* published annually by the International Monetary Fund (15). Longmire and Morey measured the real exchange rate by dividing the deflated Japanese yen by the deflated U.S. dollar (19). Data on the yen/dollar exchange rate, Japanese consumer price index, Japanese gross domestic product, and Japanese current account balance used here are from *International Financial Statistics*. The sample used to estimate the coefficients in the equations we specify consists of annual observations, and it varies with certain equations, but falls within 1956–83.

Japan is one of many U.S. client regions endogenized in the COMGEM macroeconomic model used here (20). The estimated equations in the following section constitute part of the multiregion, multicrop Armington trade sector in this annual commodity-specific general equilibrium macroeconomic model (3). Because COMGEM, an annual model, contains some 600 equations, we used the ordinary-least-squares (OLS) regression technique to estimate the coefficients in the Japanese equations.

Japanese Agricultural Import Demand and Linkage Equations

The equations in table 1 include those associated with the first- and second-stage import demand for corn and

² Notations denoting the identity of the importing nation and the period have been suppressed here for ease of exposition.

Table 1—Estimated demand and linkage equations for Japan¹

Total wheat imports (1960–83):

$$\text{TLWTJP} = 3890 + 0.0354 \cdot \text{RLYJP} - 0.0474 \cdot \text{WTWAPJP} - 63.0 \cdot \text{PETP}$$

(5.12) (– 2.20) (– 1.07)

$$R^2 = 0.865 \quad d = 1.30$$

(1.1)

Imports of U.S. wheat (1960–83):

$$\ln(\text{USWTJP}) = -5.51 + 1.57 \cdot \ln(\text{TLWTJP}) - 1.13 \cdot \ln(\text{PUSWT}/\text{WTWAP})_{t-1}$$

(20.1) (– 0.83)

$$R^2 = 0.951 \quad d = 2.14$$

(1.2)

Total corn imports (1959–83):

$$\text{TLCOJP} = 10800 + 0.0447 \cdot \text{RLYJP} - 0.0324 \cdot \text{COWAPJP}$$

(2.66) (– 0.282)

$$- 0.186 \cdot \text{SOYPUSJP} + 2370 \cdot \text{DUMMYBW}$$

(– 2.56) (3.51)

$$R^2 = 0.953 \quad d = 1.02$$

(1.3)

Imports of U.S. corn (1958–83):

$$\ln(\text{USCOJP}) = -4.30 + 1.44 \cdot \ln(\text{TLCOJP}) - 1.91 \cdot \ln(\text{PUSCO}/\text{COWAP})$$

(24.9) (– 0.896)

$$R^2 = 0.967 \quad d = 1.97$$

(1.4)

Real national income (1956–83):

$$\text{RLYJP} = 4280 + 2.94 \cdot \text{RLM1JP}$$

(30.8)

$$R^2 = 0.973 \quad d = 0.64$$

(1.5)

Consumer price index (1956–83):

$$\text{CPIJP} = 0.544 + 0.0000306 \cdot \text{NOMM1JP}$$

(32.9)

$$R^2 = 0.976 \quad d = 1.46$$

(1.5)

Real exchange rate (1956–83):

$$\text{RLXRTJP} = -17.2 + 213.0 \cdot \text{RLCHGM1JP} - 356.0 \cdot \text{RLCHGM1US}$$

(4.95) (– 1.57)

$$- 4.34 \cdot \text{RLBCAJJP} + 0.887 \cdot \text{RLUSDEF} + 0.959 \cdot \text{RLXRTJP}_{t-1}$$

(– 2.19) (2.08) (14.8)

$$R^2 = 0.953 \quad h = 1.86$$

(1.7)

Real yen-denominated world average price for wheat:

$$\text{WTWAPJP} = \text{RLXRTJP} \cdot \text{WTWAP}$$

(1.8)

Real yen-denominated world average for corn:

$$\text{COWAPJP} = \text{RLXRTJP} \cdot \text{COWAP}$$

(1.9)

Where:

COWAPJP	= Real world average price of corn during July/June marketing year, in real yen per metric ton.
COWAP	= Real world average price of corn, in real dollars per metric ton, by calendar year.
CPIJP	= Japanese consumer price index, 1967 base.
DUMMYBW	= Dummy variable for floating exchange rates after the Bretton-Woods Agreement, 0 before 1973, 1 after 1972.
PETP	= Crude petroleum price index.
NOMM1JP	= Nominal Japanese M1 money supply, in billions of yen.
PUSCO	= Real U.S. export price of corn, in real dollars per metric ton, U.S. gulf ports, by calendar year.
PUSWT	= Real U.S. export price of wheat, CIF Rotterdam, during July/June marketing year, in real dollars per metric ton.
RLBCAJJP	= Real Japanese balance on current account, in billions of real U.S. dollars.
RLCHGM1JP	= Real change in the Japanese M1 money supply.
RLCHGM1US	= Real change in the U.S. M1 money supply.
RLYJP	= Real national income (real gross domestic product) of Japan in billions of 1967 yen.
RLM1JP	= Real Japanese M1 money supply in billions of real yen.
RLUSDEF	= Real U.S. Federal budget deficit, in billions of real U.S. dollars.
RLXRTJP	= Real Japanese/U.S. exchange rate, in real yen per real U.S. dollar, and based on the “rf” yen/dollar nominal exchange rate published by the International Monetary Fund (15).
SOYPUSJP	= Real U.S. price of soybeans, CIF Rotterdam, in deflated yen per metric ton, by calendar year.
TLWTJP	= Total wheat imports by Japan from all sources during July/June marketing year, 1,000 metric tons.
TLCOJP	= Total corn imports by Japan from all sources during July/June marketing year, in 1,000 metric tons.
USCOJP	= Japanese imports of U.S. corn during July/June marketing year, in 1,000 metric tons.
USWTJP	= Japanese imports of U.S. wheat during the July/June marketing year, in 1,000 metric tons.
WTWAP	= Real world average price of wheat, CIF Rotterdam, during July/June marketing year, in real dollars per metric ton.
WTWAPJP	= Real world average price of wheat during July/June marketing year, in real yen per metric ton.

¹ Values in parentheses after an equation's title denote the equation's sample period. Values in parentheses below each coefficient represent Student t-test statistics. The term “ln” denotes the natural logarithm operator. CIF denotes cost-in-freight. The term “h” denotes the Durbin h-statistic.

wheat as well as equations that endogenize the effects of changes in Japanese macroeconomic policies on Japan's imports of corn and wheat. Capturing the linkage between Japanese monetary policy and Japan's demand for U.S. crops requires accounting for such macroeconomic policy transmission mechanisms as nominal and real yen/dollar exchange rates, the Japanese consumer price index (CPI), and real Japanese economic growth.

Statistical Results

Equations 1.1 and 1.3 in table 1 represent the first-stage or total import demands for wheat and corn by Japan. Cross-price arguments are excluded from the equation for Japanese market demand for wheat because initial regression analyses showed that the coefficients on these variables were insignificant. The weak t-statistic associated with the coefficient for the price for crude petroleum, a proxy for shipping costs in equation 1.1, may have arisen from the variable's collinearity with the Japanese real national income variable. The weak t-statistic associated with the real yen-valued world average price (WAP) of corn may arise because the price variable (COWAPJP defined by equation 1.9 and used in equation 1.3) is a poor indicator of the corn price's world average trends. We located only one non-U.S. export price for corn with enough historical observations to use in this article. Consequently, the real dollar-valued corn WAP (COWAP in equation 1.9), and hence the real yen-valued price or COWAPJP, may include an inadequate number of corn export prices and may poorly depict the real corn price's world average trends (3). The coefficient for the U.S. soybean price variable was significant in equation 1.3. All other variables in both first-stage demand equations carried significant coefficients and had the expected signs.

Equations 1.2 and 1.4 in table 1 represent Japan's second-stage demands for U.S. wheat and corn, respectively. Some Armington modelers of U.S. cotton have strayed from Armington demand theory by estimating second-stage demands in nonlogarithmic form and without the U.S. price in the denominator of the Armington price ratio (27). We follow Armington's specification more closely. Second-stage demands were estimated in logarithmic form with the U.S. price included in the denominator of the Armington price ratio. The coefficients associated with the logged first-stage demands, generated in nonlogarithmic terms in equations 1.1 and 1.3, were highly significant. The highly significant coefficients on these first-stage demands suggest strong sample evidence in support of a two-stage Japanese optimization process for determining corn and wheat imports.

The weak t-statistics for the second-stage Armington price ratios in equations 1.2 and 1.4 may have resulted

from one or both of the following reasons. First, a major cause for weak t-statistics may be the small number of world export prices incorporated in the denominator of these ratios. Only one non-U.S. corn export price and two non-U.S. wheat export prices had adequate historical observations for use here. Babula and Duffy reported significant Armington price ratios for cotton when more non-U.S. export prices were available for inclusion in the denominator of the Armington price ratio (3, 10). Second, the weak t-statistics for the coefficients on Armington price ratios may suggest that there is weak sample evidence to support Armington's assumptions about the substitution elasticity. Recall that the price ratio coefficients are estimates of the substitution elasticities for Japan's import markets for corn and wheat.

The price elasticities of Japanese demand for U.S. corn and wheat calculated by using Armington's "direct price elasticity" formula are -0.757 and -0.681 , respectively (3). We located no previous econometric estimates of the price elasticity of Japanese demand for U.S. corn and wheat against which one can compare these estimates.³ The implied price elasticity of the world demand for U.S. wheat in COMGEM's Armington-based agricultural trade sector (which includes the Japanese equations presented here), however, is -1.64 (3). The estimate does not differ appreciably from elasticities reviewed by Gardiner and Dixit (12). For example, Bredahl, Meyers, and Collins (7) reported an elasticity of -1.67 ; Ray and Parvin (22) found an elasticity of -1.50 ; and Seeley (26) reported an elasticity of -1.49 . The implied price elasticity of the world demand for U.S. corn is -1.32 in COMGEM's agricultural trade sector, which can be compared with the estimate of -1.31 reported by Bredahl, Meyers, and Collins (7) and with the estimate of -1.18 reported by Gardiner (11).

Equations 1.5 through 1.9 in table 1 capture linkages between Japanese imports of U.S. crops and the implementation of both U.S. and Japanese macroeconomic policies. Following Batten and Belongia (4, 5) and Bessler and Babula (6), the real rather than the nominal exchange rate was used in equation 1.7. Following Chambers and Just (9), the exchange rate includes both monetary and nonmonetary variables. An increase in the real yen supply is hypothesized to strengthen the real value of the dollar relative to the yen and to increase the real yen/dollar exchange rate. An increase

³ Grennes and others (14) synthesized a price elasticity of Japanese demand for U.S. wheat of -2.06 . In doing so, they assumed a coefficient associated with the logged Armington price ratio of -3.0 . Equation 1.2 in table 1 of our study reports a coefficient of -1.13 associated with this variable, although it is not significantly different from zero at the 10-percent level. The difference between their assumed coefficient of -3.0 and our estimate of -1.13 in equation 1.2 explains much of the difference between their synthesized elasticity of -2.06 and our estimated elasticity of -0.681 .

in the real U.S. money supply, however, is hypothesized to appreciate the real value of the yen relative to the dollar and to reduce the real yen/dollar exchange rate. U.S. fiscal policy is also captured through the effects that the real U.S. Federal budget deficit has on the real yen/dollar exchange rate and on real yen-denominated world average crop prices. Higher real U.S. Federal budget deficits are hypothesized to increase the demand for the dollar relative to the yen and thereby appreciate the real yen/dollar exchange rate.

Japanese monetary policy influences the first-stage, and then the second-stage, Japanese demands for wheat and corn through effects on the real Japanese exchange rate (and hence on the real yen-valued crop prices) and on real national income. Finally, the real world average prices for corn and wheat play a key role in determining trade flows. The real yen-denominated world average prices of crops influence Japan's total import demands for wheat and corn. These first-stage demand arguments are the products of the real dollar-denominated world average price and the real yen/dollar exchange rate as shown in equations 1.8 and 1.9. The dollar-denominated real world average price for the commodity also serves as the denominator of the Armington price ratio, which influences the Japanese second-stage demand as shown in equations 1.2 and 1.4.

Validation Beyond the Sample

Thompson has criticized agricultural trade models because they often fail to validate the model beyond the sample period (28). To counter this criticism, we simulated the equations presented in table 1 within the COMGEM model for the 1 year beyond the sample period for which data were available when the analysis was done. Recall that Japan represents but one client region in COMGEM's agricultural trade sector (3). The percentage forecast error 1 year beyond the sample period for total U.S. exports of wheat was -1.29 percent, whereas the percentage forecast error for total U.S. corn exports was 2.82 percent.

The percentage forecast errors associated with the Japanese first-stage or total market demand for wheat and corn imports 1 year beyond the sample period were 2.5 percent and -12.3 percent, respectively. The percentage forecast errors associated with the nonlogged second-stage demand for Japanese imports of U.S. wheat and corn were 11.03 and 1.90 percent, respectively. Finally, the percentage forecast errors associated with the real Japanese national income, consumer price index, and real exchange rate variables 1 year beyond the sample period were -10.9 percent, 0.7 percent, and 4.95 percent, respectively.

Analysis of Alternative Japanese Monetary Policies

Japan is an extremely important U.S. trading partner, accounting for 8.7 percent of U.S. wheat exports and 27.4 percent of U.S. corn exports in 1982-84 (3, pp. 140-41). Japan also accounted for a third of the unprecedented \$100 billion increase in U.S. nominal annual trade deficits during 1980-85 (23). Many have attributed the growing Japanese/U.S. trade imbalance to "structural" factors such as a Japanese affinity for its own goods and its protectionist trade policies. Reinhart (23) refutes this hypothesis, contending that the growing imbalance with Japan has arisen because of macroeconomic disturbances. Reinhart specifically suggests that the increased U.S. trade deficit with Japan is due to a strong value of the dollar relative to the yen and to the narrowing of the annual growth rate differential between real national incomes in Japan and the United States.

Scenario Design

We examined three Japanese monetary policy scenarios, each cast within the context of a continuation of current U.S. and non-Japanese foreign macroeconomic policies.⁴ The baseline monetary policy scenario assumed a series of 3.27-percent annual growth rates in the Japanese M1 money supply, the average annual growth rate in Japanese M1 observed in 1983-85. We used this baseline as a basis of comparison for two alternative series of annual growth rates in the Japanese money supply. A "moderate-growth" monetary policy scenario assumes a series of 6.02-percent annual growth rates in Japan's M1 money supply, the average annual growth rate in Japan's M1 during 1978-82. Finally, a "high-growth" monetary policy scenario assumes a series of 16.8-percent annual growth rates in Japan's M1 money supply, the annual growth rate in 1972.

Klein (18, p. 2) notes that this type of scenario analysis is useful, but cannot be validated. Consequently, the Japanese monetary policy scenarios were limited to observed experience in the post-1971 era of floating exchange rates.

Nominal vs. Real Exchange Rates

Part of the debate as to whether nominal or real exchange rates explain real U.S. export consignments relates to the concept of purchasing power parity. If an increase in the nominal yen/dollar exchange rate is offset by a lower ratio of U.S. to Japanese general price levels, purchasing power parity holds and *real* exchange rates

⁴ It is unlikely that the macroeconomic policies of other nations would not respond to changes in Japanese monetary policies assumed in these scenarios. Nonetheless, these policy reactions are not systematically predictable, and we assumed that they are constant.

Table 2—Change from baseline values for selected variables under alternative Japanese monetary growth rates, 1986–90

Item	1986	1987	1988	1989	1990
	<i>Percent</i>				
Moderate money growth:					
U.S. wheat exports to Japan	0.2	0.5	0.7	0.9	1.1
U.S. corn exports to Japan	.0	.1	.1	.2	.2
Nominal exchange rate	3.1	6.9	11.3	14.9	17.1
Real exchange rate	.8	2.2	4.1	5.0	4.6
Japan's consumer price index	2.2	4.6	6.9	9.5	12.0
Japan's real national income	.4	.8	1.1	1.4	1.7
High money growth:					
U.S. wheat exports to Japan	1.1	2.0	2.9	3.7	4.4
U.S. corn exports to Japan	.1	.4	.5	.8	.9
Nominal exchange rate	15.1	35.5	61.1	85.1	102.8
Real exchange rate	3.7	9.7	16.8	20.1	17.4
Japan's consumer price index	11.0	23.5	37.9	54.2	72.7
Japan's real national income	1.8	3.4	4.7	5.9	6.8

remain unchanged. Thus, the real yen-denominated world average prices for wheat and corn in the first-stage equations would remain unaltered and would not cause changes in Japan's imports of these commodities. Although strict purchasing power parity is rarely observed in the real world, particularly in the short run, the forces underlying this concept should be captured when one investigates trade flows and market shares.

The results presented in table 2 show that moderate- and high-growth Japanese monetary policy scenarios sharply increase the nominal yen/dollar exchange rates over baseline levels in 1986–90. The nominal exchange rate (and hence the nominal crop prices valued in yen) under the moderate-growth monetary scenario is 17.1 percent higher than the baseline value by 1990. The rate in 1990 would be almost 103 percent higher than the baseline value under the high-growth monetary policy scenario. Table 2 shows, however, that U.S. wheat and corn exports to Japan over this period do *not* change appreciably from baseline values despite the substantial increase in nominal exchange rates.

These results contrast sharply with the implications one draws from earlier studies by Schuh (24, 25), Johnson and others (17), and Chambers and Just (9), which suggest that an increase (decrease) in nominal exchange rates would discourage (encourage) exports. Although such a situation can occur in periods of slowly rising prices, these studies appear to ignore the possibility that monetary policies leading to higher nominal exchange rates may also boost inflation rates, which cheapen the real value of the domestic currency and lower real exchange rates.⁵ The increases in real yen/

dollar exchange rates (and hence in crop prices valued in real yen) associated with the assumed annual percentage changes in the Japanese money supply were much lower than their nominal counterparts (table 2).

Real Economic Growth

Real Japanese national income (table 1) represents a significant determinant of Japan's total import demand for wheat and corn (see equations 1.1 and 1.3). Table 2 suggests that the series of annual growth rates in Japan's M1 money supply assumed in the monetary policy scenarios for moderate and high growth corresponded to higher real Japanese M1 levels and raised the real national income of Japan. These higher levels of annual real national income enhanced Japanese first-stage import demands for wheat and corn, and in turn, Japanese second-stage demands for U.S. supplies of these commodities. We can explain the modest increase in Japan's imports of U.S. corn and wheat, rather than the sharp decrease one might have expected in light of the sharply higher nominal annual exchange rates reported in table 2, with analysis of two additional transmission mechanisms: (1) higher Japanese inflation and (2) higher real national income in Japan. The higher Japanese inflation increased the real exchange rate's denominator, and it provided increases in real exchange rates (and hence in crop prices valued in real yen) that were less than increases in nominal exchange rates. The higher real economic growth in Japan positively influenced Japanese imports of U.S. crops. Table 2 suggests that these two factors counteracted the negative effect of higher annual nominal yen/dollar exchange rates, and they actually led to modest expansion in Japanese imports of U.S. corn and wheat. This result supports

⁵ Japan's nominal growth in the early eighties declined sharply from an average annual 6.02 percent in 1978–82 to 3.27 percent in 1983–85. During 1982–85, the United States followed an expansionary fiscal policy and a moderately expansionary monetary policy. Many analysts might have expected: (1) the U.S. dollar to have cheapened relative to

the yen, (2) the yen-valued prices of U.S. crop exports to have declined, and (3) U.S. crop exports to have risen. Yet this sequence of events failed to occur. In fact, the general trade imbalance with Japan rose by an unprecedented amount in 1981–85 (23).

recent conclusions by Batten and Belongia, who assert that real, rather than nominal, exchange rates influence real economic variables such as U.S. exports of farm products (4, 5). Real Japanese economic growth is a major determinant of Japan's imports of U.S. crops, a finding that coincides with Reinhart's (23) more general conclusion that real growth is a key determinant of Japan's imports of general U.S. merchandise.

Conclusions

Purchasing power parity forces account for changes in relative Japanese/U.S. inflation rates under alternative Japanese monetary policies. They appear to be important, although imperfect, explanations of Japan's response in U.S. crop imports to alternative Japanese monetary policies. Alternative Japanese monetary policies have combined effects on Japan's inflation rates, real and nominal yen/dollar exchange rates, and real national income. These combined effects, with offsetting influences on Japan's imports of U.S. crops, illustrate how essential it is for analysts to account for the inflation and national income linkages, as well as the nominal exchange rate linkage, when they model agricultural trade flows. Consequently, analysts should avoid analyzing such flows in a partial equilibrium context.

Higher annual growth rates in Japan's M1 money supply would not appreciably influence (that is, reduce) Japan's imports of U.S. wheat and corn. In fact, the more rapid expansion of Japan's M1 money supply would modestly increase imports of U.S. wheat and corn each year. Higher nominal yen/dollar exchange rates would be offset by a higher Japanese consumer price index and higher growth in real national income. Thus, the adoption of more expansionary monetary policies by the Japanese Government should not be seen by U.S. farmers and farm policymakers as a necessary signal for decreased sales of U.S. farm products to Japan. Further analysis is needed to determine if imports of U.S. crops by our other agricultural trading partners would be more sensitive than Japan to efforts to expand their economies.

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In Earlier Issues

It is common knowledge that nonsampling errors, or response errors, are often large enough to cause serious trouble. Estimation of number of farms is a good example. A small area sample for use in estimating the number of farms in the United States with a sampling error of less than 1 percent can be easily designed, but means have not been found for holding the nonsampling error to a negligible quantity because of the problem of defining a farm and following the definition in the field. Differences in farm counts as large as 10 or 15 percent have been observed between surveys when the sampling standard errors were known to be as low as 2 or 3 percent.

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Export Responsiveness and U.S. Farm Policy Options for Wheat

Larry Salathe

Abstract. *The effects of alternative farm policies on the U.S. wheat sector are similar despite quite different assumptions for the price elasticity of exports. The goal of reducing the Federal cost of the 1985 wheat program directly conflicts with the goal of maintaining farm income. The article compares four policy options for wheat, ranging from a reduction in price supports and elimination of deficiency payments and acreage programs to an expansion of voluntary acreage reduction programs, under alternative assumptions regarding the responsiveness of exports. Each option is compared with a continuation of the 1985 wheat program.*

Keywords. *Exports, farm income, farm policy, program costs, wheat.*

After nearly 12 months of debate, Congress passed the Food Security Act of 1985. The debate leading up to and following its passage brought to the forefront two opposing views on the future direction of agricultural policy. One group argued that past farm programs have left U.S. agriculture at a competitive disadvantage in world markets and have distorted market signals to both domestic and foreign producers. This group argued that agriculture must, therefore, become more market-oriented. The other group argued that elimination of farm programs would worsen an already severe financial crisis. This group favored expansion of acreage and production controls and higher support prices as the appropriate direction for future agricultural policy. The debate on the future direction of farm policy will surely continue, given the current farm financial situation, the accelerating cost of farm programs, and pressure to reduce the Federal budget deficit.

In this article, I analyze the effects of four alternative farm policies on U.S. wheat producers, taxpayers, and consumers: (1) eliminating voluntary acreage programs, (2) lowering loan rates, (3) eliminating direct payments, and (4) expanding voluntary acreage programs. I compare each policy with continuing the 1985 wheat pro-

gram. The alternatives are simulated for crop years 1986/87 through 1991/92 under various wheat export elasticity assumptions. These simulations are designed to show the effects on farm and retail levels and on the Federal budget as well as the extent to which export responsiveness can alter these effects. I do not attempt to determine the export elasticity *per se*, but rather how the choice of export elasticity influences the predicted outcomes of alternative policies. A previous article examined the consequences of alternative export subsidy programs for U.S. wheat (4).¹ Here I examine how changes in domestic farm programs affect U.S. wheat producers, consumers, and taxpayers.

Domestic Farm Policy and Export Response

Wheat exports currently account for about half of total annual disappearance of U.S. wheat. Stated differently, if the United States were to withdraw from the wheat export market, wheat planted acreage would have to be reduced 50 percent or more to balance supply and demand. Thus, the outcomes of alternative wheat programs are thought to be strongly influenced by wheat export response. Table 1 shows the potential effects of alternative farm programs on farmers, domestic consumers, and taxpayers under various export elasticity assumptions. Each policy option is compared with the 1985 wheat program.

Lower Loan Rate

The first option, lowering the loan rate, will depress farm prices assuming market prices are initially supported by the loan rate. The incomes of farmers not participating in farm programs will fall. The drop in these farmers' incomes will encourage additional participation in announced acreage reduction programs. The amount of land idled will rise and more farmers will become eligible for price-support commodity loans and income support payments. The incomes of farmers, who had previously participated in farm programs, will be virtually unaffected by a drop in the loan rate because lower prices will be nearly offset dollar-for-dollar by

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¹ Italicized numbers in parentheses refer to items listed in the References at the end of this article.

Table 1—Qualitative effects of policy options

Option	Export elasticity	
	Inelastic	Elastic
<i>Baseline = 1985 program</i>		
Lower loan rate:		
Net farm income	?	?
Taxpayer costs	+	—
Consumer expenditures	—	—
Lower loan rate, no acreage programs:		
Net farm income	+	+
Taxpayer costs	+	?
Consumer expenditures	—	—
Lower loan rate, no acreage programs, and no deficiency payments:		
Net farm income	—	?
Taxpayer costs	?	—
Consumer expenditures	—	—
Expand acreage reduction programs:		
Net farm income	?	?
Taxpayer costs	?	?
Consumer expenditures	?	?

? = Uncertain.

larger income support (deficiency) payments. Total aggregate net farm income may rise or fall, depending on whether larger direct Government payments triggered by lower farm prices and higher participation offset the loss in market receipts as prices fall. The degree of responsiveness of exports to a change in price could change how much prices fall as the loan rate is reduced, but the effect of lowering the loan rate on farm income would remain uncertain.

Lowering the loan rate increases Government income support payments, but reduces the cost of supporting farm prices at the loan rate. Income support payments are based on the difference between an announced target price and the maximum of the loan rate and farm price over a designated portion of the crop year. Lower farm prices and increased program participation will increase income support payments. However, the cost of supporting farm prices declines. Lower prices encourage more farmers to participate in acreage-idling programs, thereby cutting production, and lower prices also increase domestic use and exports. Thus, lowering the loan rate reduces the surplus the Government must purchase to support prices at the lower loan rate.

The net effect on Government costs of reducing the loan rate depends on the price responsiveness of wheat demand. If exports are inelastic, larger income support payments will more than offset lower costs of supporting prices at the lower loan rate, causing total Government costs to rise. If exports are elastic, Government costs will fall because the decline in the cost of supporting prices will exceed the increase in income support payments.

Domestic consumer demand for wheat products is quite unresponsive to changes in prices. Elasticity estimates range from -0.02 to -0.20 (1, 3, 4). Thus, lower prices will change retail demand only slightly, and a drop in market prices will reduce retail expenditures for wheat products.

Lower Loan Rate and No Acreage Programs

Under the second option, a lower loan rate and no acreage programs, producers would be required neither to idle land nor to plant within their base to be eligible for income support payments and price-support commodity loans. The loan rate would also be reduced to increase the competitiveness of U.S. wheat. The European Community's farm policy has the same attributes: above market-clearing guaranteed returns to producers and no acreage control programs.

The net income of producers would be higher under the second option than under the 1985 farm program. Because acreage reduction programs are eliminated, all wheat producers would be eligible to receive income support payments on their planted acreage. More farmers would become eligible for payments, and eliminating the requirement to idle land would allow producers to receive income support payments on a larger volume of production. Net farm income would rise regardless of the responsiveness of wheat exports.

Farm program costs may rise or fall, depending on the responsiveness of exports. If exports are inelastic, farm program costs will rise because larger income support payments will more than exceed the decline in the cost

of supporting prices at the reduced loan rate. However, if exports are price-elastic, program costs could fall as lower costs to support prices at the reduced loan rate might offset the increase in income support payments.

Retail consumer expenditures for wheat products will decline under the second option. Lowering the loan rate will reduce market prices. Demand increases, but by less than the percentage reduction in market prices, causing expenditures to fall.

Lower Loan Rate, No Acreage Programs, and No Income Support Payments

Under the third option, a lower loan rate, no acreage programs, and no income supports, deficiency payments and voluntary acreage reduction programs are eliminated. The loan rate is also lowered to increase the competitiveness of U.S. wheat in world markets. Eliminating income support payments reduces net farm income, but eliminating acreage reduction programs has the opposite effect. Farmers may expand production and increase marketings, potentially offsetting the decline in income support payments. If exports are inelastic, net farm income will fall as the change in market receipts will be small compared with the loss in income caused by eliminating income support payments. If exports are elastic, the increase in market receipts may offset the loss in income caused by eliminating income support payments.

Taxpayer costs are expected to be below those for the 1985 wheat program, if exports are elastic. Eliminating acreage reduction programs is expected to increase wheat production. Larger wheat production will raise the cost of supporting farm prices. These added costs will likely be more than offset by budget savings from eliminating income support payments, especially if exports are elastic. If exports are inelastic, budget savings from eliminating income support payments may be offset by higher price-support costs.

Lower market prices will again lower retail expenditures for wheat products under the third option.

Expand Acreage Reduction Programs

Under the fourth option, an expansion of acreage reduction programs, wheat producers must idle additional land to obtain income support payments and price-support commodity loans. A policy of larger acreage reduction programs and relatively high loan rates would reduce U.S. competitiveness compared with the previous options. This policy option is generally advocated on the basis that it would maintain farm income at a relatively high level, yet reduce taxpayer costs.

Increasing the unpaid acreage-idling requirement reduces the incentive to participate in acreage-idling programs. Fewer farmers voluntarily participate in the announced program, and thus fewer receive income support payments. Former participants expand production, whereas those who continue to participate reduce production. The net effect on production is uncertain. If production declines, net farm income will necessarily decline because lower deficiency payments will exceed any increase in market receipts of farmers who opt not to participate in the expanded voluntary acreage programs. However, net income may increase if production increases and exports are inelastic. Farm income could also increase if farmers are compensated for the larger acreage-idling (paid land diversion) requirement.

The effect of the fourth option on taxpayer costs and consumer expenditures is also uncertain. If production increases and prices fall, retail consumer expenditures will fall. However, if production falls and prices rise, consumer expenditures will also rise.

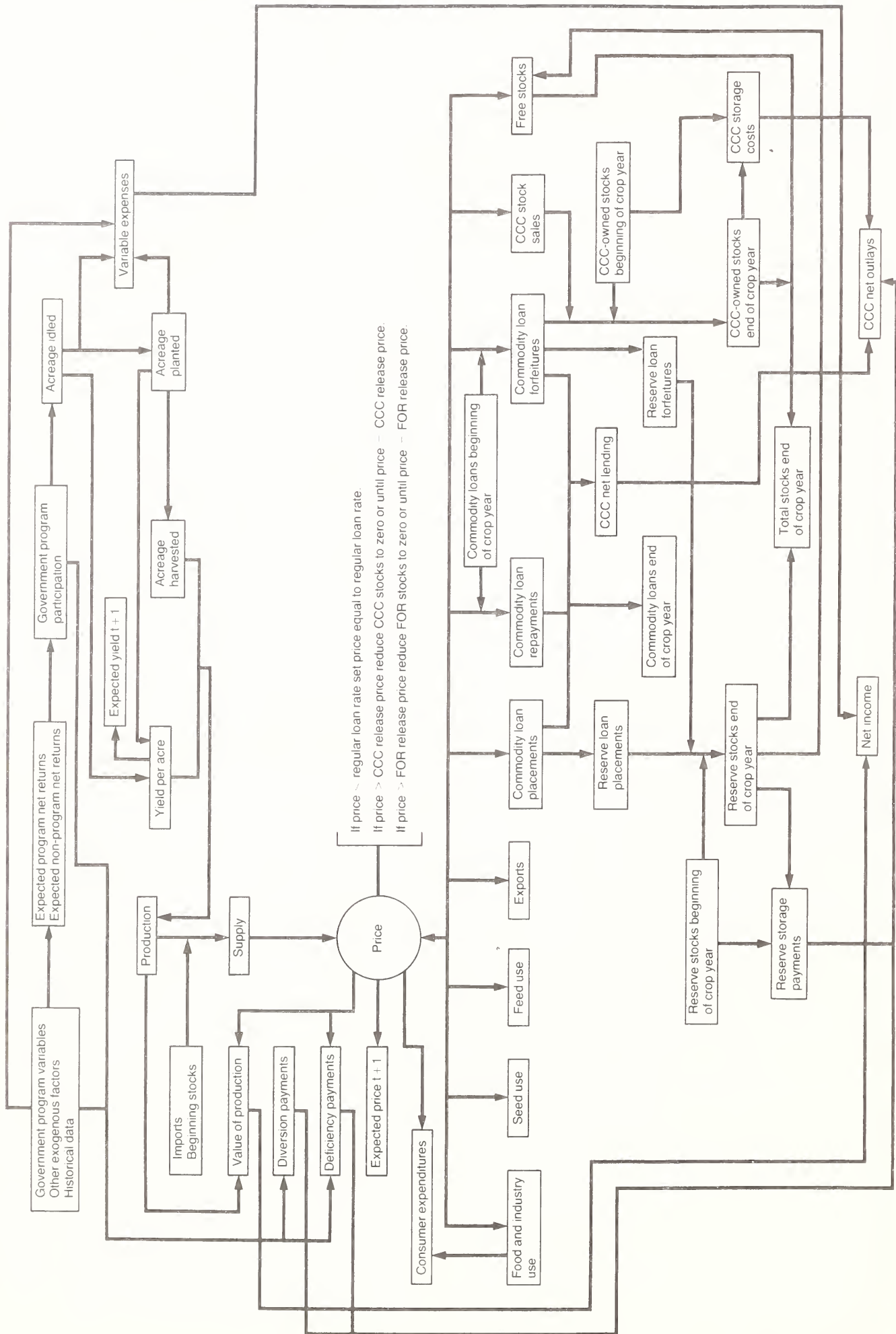
If production falls, taxpayer costs will drop under the fourth option. Fewer farmers will be eligible for payments, and those who receive income support payments will receive less because their planted acreage will be lower. Lower production will further reduce the cost of supporting wheat prices. However, if production rises, taxpayer costs could rise or fall, and the net result will depend heavily on the price responsiveness of wheat exports.

Research Method

A computer simulation model of the U.S. wheat sector is used to quantify the effects of each policy alternative. The model consists of 39 equations to estimate wheat production, use, price, Commodity Credit Corporation (CCC) loan activity, producers' gross and net income, consumer expenditures for wheat products, and Government wheat program outlays. The model's simultaneous system of equations is solved on a personal computer with the LOTUS 1-2-3 software. All functions are linear in parameters, but the assumed intercept and slope coefficients can be changed each year, thereby allowing one to analyze alternative policies over a range of supply and use elasticities. The model's default response coefficients were derived from previous empirical studies of the wheat sector (2, 3, 5).

A simulation begins by providing historical and exogenous data, including values for Government policy variables (see figure). The model uses data on target prices, loan rates, acreage reduction and diversion rates, past yields, and prices to estimate acreage response to Government programs. With these data and slope and

Flow chart of computer simulation model



intercept coefficients for production and demand functions, the model determines equilibrium prices and quantities through an iterative process.

Supply

The model assumes that relative profitability determines whether farmers participate in voluntary acreage control programs. The greater the expected relative profitability of participation, the greater the rate of farmer participation. The expected farm price times the expected yield (5-year moving-average excluding high and low) less variable production costs provides the estimated return from nonparticipation. The target price, expected farm price, loan rate, expected yield, acreage reduction and diversion rates, diversion payment rate, and program yield are combined to estimate the return from participation.

I calculated acreage idled by an identity using the program participation rate, base acreage, and acreage reduction and diversion rates. Acreage planted is estimated from acreage idled adjusted for slippage (0.33) and the expected returns from participation and nonparticipation (0.15).² An increase in expected returns is assumed to be an incentive for producers to plant additional acreage, whether from market forces or from farm programs.

Acreage harvested is a linear function of acreage planted (0.908), and yield per acre is a function of acreage planted (0.046) and acreage idled (0.13). It is assumed farmers idle their least productive land; therefore, an increase in idled area causes average yield to increase. Production equals acreage harvested times yield per harvested acre, whereas supply equals production plus beginning-year stocks plus imports.

Use

The model estimates food and industrial use, seed use, feed use, exports, and ending-year stocks. Stocks consist of three components: farmer-owned reserve, CCC-owned stocks, and free stocks. Food and industrial use (– 12.5), exports (– 200), and feed use (– 108) are linear functions of price with slope coefficients based on econometric results of previous studies. The default slope coefficients assume feed use is slightly price-elastic, food and industrial use is exceedingly inelastic, and exports are moderately inelastic. Seed use is a linear function of acreage planted (1.23).

Free stocks are specified as a function of price (– 130) and the quantity of farmer-owned reserve stocks (– 0.30). A 1-bushel increase in reserve stocks is assumed to reduce the demand for free stocks less than 1

bushel. Wheat placed in the farmer-owned reserve is assumed to remain for 5 years, unless market price equals or exceeds the release price, at which time reserve stocks are returned to the market. If price fails to reach the release level, reserve stocks default to the CCC.

CCC stocks are those acquired by the Government through price-support programs as farmers default on reserve and regular 9-month loans. They become available to the market when price exceeds the reserve release by 5 percent.

Loan Activity

The model predicts price-support loan activity based on farm price, the loan rate, and CCC interest charges. Total loan placements (farmer-owned reserve and regular) are estimated as a function of farm price divided by the loan rate (– 766.8). Reserve loan placements are also a linear function of the ratio of farm price to the loan rate (– 450). Farmers are assumed to repay their loans if price exceeds the loan rate plus interest charges; if not, commodity collateral is defaulted and added to existing CCC-owned stocks.

Farm Price

One can determine the farm price of wheat by solving the supply-demand equilibrium condition for price. The equilibrium price equates total supply with total use plus ending stocks. Because total supply is predetermined at the beginning of the crop year and all use and ending stock equations are linear in price, I used the supply-demand identity to determine the price that uniquely equates supply and demand.

Decision rules are used to adjust initial price estimates when they exceed either the farmer-owned reserve or CCC release triggers, or when price falls below the loan rate. The loan rate is assumed to act as a price floor or the minimum price. Reserve and CCC stocks are assumed to be accessible to the market whenever price exceeds their corresponding release triggers. Thus, the farm price is assumed not to exceed the release triggers for reserve or CCC stocks unless these stocks become depleted.

Producer Income

The model estimates gross and net income of wheat producers from previously estimated endogenous variables and exogenous data or policy variables. For example, net income is the sum of the value of production (price times production), deficiency payments, diversion payments, and reserve storage payments, less variable costs of production.

² Numbers in parentheses denote default model coefficients.

CCC Outlays

The model estimates net CCC outlays on a fiscal-year basis. I derived these estimates by allocating crop-year (June–May) loan activity and Government payments among fiscal years (October–September). Government payments consist of diversion, deficiency, and farmer-owned reserve storage payments. I estimated CCC price-support loan outlays by subtracting the value of loan placements (quantity times the loan rate) from loan repayments. I estimated the cost of storing and handling CCC-owned stocks by multiplying average CCC stock holdings by a fixed cost per bushel (0.42).

Consumer Expenditures

I estimated consumer expenditures for bakery products by multiplying the wheat price times the quantity used for food and industrial use and then by adding a constant amount for marketing, processing, and transportation.

Baseline

Each policy option was simulated for 6 crop years, 1986/87–1991/92. I assumed productivity would continue to increase at about the same annual rate as the past decade, about 0.6 bushel per acre. Food and industrial use should increase with population growth, from about 650 million bushels in 1985/86 to 700 million bushels in 1991/92. Export growth will likely be slower than in the seventies as the dollar is expected to remain strong in relation to historical levels.

Given these assumptions and a continuation of the 20-percent voluntary acreage reduction and 10-percent paid land diversion programs for 1985 with a \$4.38 target price and a \$3.30 loan rate, I estimated a baseline for the 6-year period. The acreage reduction and paid land diversion programs remove about 20 million acres from production each year. Yet, ending stocks grew steadily with the \$3.30 loan rate, essentially determining the price of wheat over the period. CCC net outlays average over \$4.3 billion annually with over a half accounted for by deficiency and diversion payments. Producers' net income averaged nearly \$7 billion per year.

Analysis of the Options

I analyzed four policy options and compared them with the baseline (continuation of the 1985 program). Each option is simulated with the elasticity of U.S. wheat exports ranging from -0.25 to -4.00 , reflecting the disparity in estimates from past studies of U.S. wheat export response (4).

The first option assumes the loan rate is lowered from \$3.30 to \$2.50 per bushel, but all other 1985 wheat program provisions are unchanged. The second option assumes elimination of voluntary acreage reduction and paid land diversion programs as well as a reduction in the loan rate from \$3.30 to \$2.50 per bushel. The third option assumes elimination of voluntary acreage programs and deficiency payments and a reduction in the loan rate (\$3.30 to \$2.50). The fourth option assumes an expansion of voluntary acreage and paid land diversion programs and a loan rate of \$3.30 and a target price of \$4.38 per bushel.

Lower Loan Rate

The first option, lowering the loan rate, also lowers the price received for wheat. The extent of the price decline, however, depends on the elasticity of U.S. exports (table 2). For example, if the export elasticity is -0.25 , the simulation model estimates farm price would average \$0.40 per bushel lower than the baseline, but only \$0.10 per bushel lower if the export elasticity is -4.00 . Despite lower prices, producers' net income changes only moderately, because lower prices increase deficiency payment rates and encourage greater participation in acreage reduction programs. More producers are eligible for deficiency payments; thus, lower sales receipts are largely offset by larger deficiency payments. Higher participation and lower prices cause planted acreage to decline, reducing aggregate variable production expenses relative to the baseline.

CCC outlays (taxpayer costs) would rise moderately if exports are inelastic and would decline moderately if exports are elastic. If the export elasticity equals -0.50 , net CCC outlays average \$238 million higher. If the export elasticity equals -2.00 , net CCC outlays fall, on average, by \$369 million. These changes reflect the combined effect of larger diversion and deficiency payments due to lower farm prices and increased program participation, as well as lower CCC and reserve loan activity due to the lower loan rate. If exports are inelastic, the increase in deficiency and diversion payments exceed the decline in loan activity, whereas the opposite occurs when exports are elastic. But even when the export elasticity equals -4.00 , CCC net outlays still exceed \$3.7 billion annually, 15 percent less than the baseline.

Consumer expenditures for bakery products vary only moderately from their baseline values: \$258 million less per year when the export elasticity equals -0.25 , but only \$67 million less per year if the export elasticity is -4.00 . Thus, lowering the loan rate, by itself, appears to only moderately affect producers, consumers, and taxpayers.

Table 2—Option 1: Lower loan rate¹

Item	Unit	Baseline	Export elasticity				
			- 0.25	- 0.50	- 1.00	- 2.00	- 4.00
Acreage planted	Mil. ac.	72.2	69.4	69.8	70.3	70.9	71.4
Acreage harvested	Mil. ac.	64.9	62.4	62.8	63.3	63.8	64.3
Yield per acre	Bu./ac.	41.4	41.9	41.8	41.7	41.6	41.6
Supply:							
Beginning stocks	Mil. bu.	2,309	1,968	1,942	1,909	1,876	1,849
Production	Mil. bu.	2,689	2,614	2,624	2,640	2,656	2,669
Imports	Mil. bu.	3	3	3	3	3	3
Total	Mil. bu.	5,001	4,585	4,569	4,552	4,535	4,521
Use:							
Food and industrial	Mil. bu.	683	688	687	686	685	684
Seed	Mil. bu.	91	87	88	89	89	90
Feed	Mil. bu.	264	307	300	291	282	275
Exports	Mil. bu.	1,387	1,429	1,457	1,494	1,532	1,563
Total	Mil. bu.	2,425	2,511	2,532	2,560	2,588	2,612
Ending stocks	Mil. bu.	2,576	2,074	2,037	1,992	1,947	1,909
Price	Dol./bu.	3.30	2.90	2.97	3.05	3.13	3.20
Income indicators:							
Value of production	Mil. dol.	8,873	7,584	7,787	8,043	8,309	8,530
Deficiency payments	Mil. dol.	1,995	3,199	3,020	2,786	2,550	2,364
Storage payments	Mil. dol.	155	89	79	67	54	44
Diversion payments	Mil. dol.	812	917	905	883	860	841
Total gross income	Mil. dol.	11,835	11,790	11,792	11,779	11,773	11,778
Variable costs	Mil. dol.	5,026	4,882	4,901	4,931	4,962	4,987
Total net income	Mil. dol.	6,809	6,908	6,891	6,848	6,811	6,791
Net CCC outlays: ²							
Deficiency payments	Mil. dol.	1,965	3,133	2,953	2,725	2,499	2,320
Diversion payments	Mil. dol.	813	927	913	889	864	844
Storage payments	Mil. dol.	152	87	77	65	53	43
Net lending	Mil. dol.	804	157	125	86	46	13
Other costs	Mil. dol.	601	506	505	505	505	505
Net outlays	Mil. dol.	4,336	4,810	4,573	4,271	3,967	3,725
Consumer expenditures ³	Mil. dol.	37,776	37,518	37,561	37,613	37,666	37,709

¹ Unless indicated otherwise numbers are averages for the 6 crop years, 1986/87-1991/92.

² Fiscal year 1987-91 averages.

³ Consumer expenditures for bakery products.

Lower Loan Rate and No Acreage Programs

Under the second option, wheat producers expand planted acreage an annual average of about 18.5 million acres (table 3). This expansion reflects the absence of voluntary acreage reduction and paid land diversion programs with a guaranteed return of \$4.38 per bushel. The expansion in acreage places pressure on prices. Farm price averages \$0.30-\$0.80 per bushel lower than under continuation of 1985 programs, depending on the export elasticity.

However, despite the lower farm price, wheat producers' net incomes are projected to increase. Although cash receipts fall for most values of the export elasticity, they are more than offset by larger deficiency payments. Deficiency payments average \$4.5-\$5.9 billion

per year under the second option, compared with less than \$2.0 billion under continuation of 1985 programs. Producers' net incomes average about \$1 billion higher, 15 percent more than the baseline.

CCC net outlays increase considerably, especially if exports are inelastic. With inelastic exports, CCC net outlays average \$2.7-\$3.4 billion higher than under the baseline. Even if exports are elastic, higher deficiency payments are not offset by the elimination of diversion payments and by reduced loan activity and reserve commodity storage payments.

Consumer expenditures for bakery products average \$195-\$521 million lower. The reduction is about double that when only the loan rate is lowered. The second

Table 3—Option 2: Lower loan rate and no acreage programs¹

Item	Unit	Baseline	Export elasticity				
			- 0.25	- 0.50	- 1.00	- 2.00	- 4.00
Acreage planted	Mil. ac.	72.2	90.6	90.6	90.6	90.5	90.5
Acreage harvested	Mil. ac.	64.9	81.7	81.7	81.7	81.6	81.6
Yield per acre	Bu./ac.	41.4	37.8	37.8	37.8	37.8	37.8
Supply:							
Beginning stocks	Mil. bu.	2,309	2,766	2,560	2,288	2,022	1,930
Production	Mil. bu.	2,689	3,084	3,084	3,084	3,082	3,080
Imports	Mil. bu.	3	3	3	3	3	3
Total	Mil. bu.	5,001	5,853	5,647	5,375	5,107	5,014
Use:							
Food and industrial	Mil. bu.	683	693	693	692	689	687
Seed	Mil. bu.	91	113	113	113	113	113
Feed	Mil. bu.	264	350	349	341	321	296
Exports	Mil. bu.	1,387	1,472	1,555	1,690	1,834	1,896
Total	Mil. bu.	2,425	2,628	2,711	2,837	2,958	2,992
Ending stocks	Mil. bu.	2,576	3,225	2,935	2,539	2,148	2,022
Price	Dol./bu.	3.30	2.50	2.50	2.58	2.77	3.00
Income indicators:							
Value of production	Mil. dol.	8,873	7,711	7,714	7,959	8,532	9,234
Deficiency payments	Mil. dol.	1,995	5,883	5,882	5,780	5,202	4,483
Storage payments	Mil. dol.	155	155	154	140	109	75
Diversion payments	Mil. dol.	812	0	0	0	0	0
Total gross income	Mil. dol.	11,835	13,749	13,751	13,879	13,844	13,791
Variable costs	Mil. dol.	5,026	5,906	5,906	5,905	5,901	5,897
Total net income	Mil. dol.	6,809	7,843	7,845	7,974	7,943	7,895
Net CCC outlays: ²							
Deficiency payments	Mil. dol.	1,965	5,831	5,831	5,717	5,140	4,435
Diversion payments	Mil. dol.	813	0	0	0	0	0
Storage payments	Mil. dol.	152	152	151	137	107	73
Net lending	Mil. dol.	804	1,065	835	559	217	107
Other costs	Mil. dol.	601	693	634	595	505	506
Net outlays	Mil. dol.	4,336	7,741	7,451	7,007	5,970	5,120
Consumer expenditures ³	Mil. dol.	37,776	37,255	37,255	37,308	37,431	37,581

¹ Unless indicated otherwise, numbers are averages for the 6 crop years, 1986/87–1991/92.

² Fiscal year 1987–91 averages.

³ Consumer expenditures for bakery products.

option would raise producers' net incomes considerably, would slightly lower consumer expenditures, and would increase CCC net outlays significantly.

Lower Loan Rate, No Acreage Programs, and No Deficiency Payments

The second option resulted in larger CCC net outlays, primarily because deficiency payments were paid on full production. With no deficiency payments, the third option, CCC outlays would be reduced greatly; but so would wheat producers' incomes. Annual net income averages \$3.3–\$4.5 billion less (a 48- to 68-percent decline) than under a continuation of 1985 programs (table 4).

CCC net outlays drop considerably, averaging \$0.6–\$1.2 billion per year compared with \$4.3 billion per year

under a continuation of the 1985 programs. Producers' incomes tend to fall more than CCC net outlays, especially if exports are inelastic. For example, if the export elasticity is - 0.50, net income declines \$4.4 billion while CCC net outlays decline \$3.4 billion per year. If the elasticity is - 4.00, net income declines \$3.3 billion, while CCC net outlays decline \$3.7 billion.

Consumer expenditures for bakery products average \$123–\$400 million lower than under the 1985 programs. The third option would severely reduce the income of wheat producers, sharply cut taxpayer costs, but only moderately reduce consumer expenditures.

Expand Voluntary Acreage Programs

Under the third option, acreage programs and deficiency payments were eliminated, causing both farm

Table 4—Option 3: Lower loan rate, no acreage programs, and no deficiency payments¹

Item	Unit	Baseline	Export elasticity				
			- 0.25	- 0.50	- 1.00	- 2.00	- 4.00
Acreage planted	Mil. ac.	72.2	81.2	81.3	81.8	82.6	83.2
Acreage harvested	Mil. ac.	64.9	73.1	73.2	73.7	74.4	74.9
Yield per acre	Bu./ac.	41.4	38.2	38.2	38.2	38.1	38.1
Supply:							
Beginning stocks	Mil. bu.	2,309	2,236	2,125	2,006	1,939	1,886
Production	Mil. bu.	2,689	2,791	2,795	2,811	2,835	2,854
Imports	Mil. bu.	3	3	3	3	3	3
Total	Mil. bu.	5,001	5,030	4,923	4,820	4,777	4,743
Use:							
Food and industrial	Mil. bu.	683	691	690	689	687	685
Seed	Mil. bu.	91	102	102	103	104	104
Feed	Mil. bu.	264	330	328	315	298	284
Exports	Mil. bu.	1,387	1,452	1,512	1,589	1,656	1,709
Total	Mil. bu.	2,425	2,575	2,633	2,696	2,745	2,783
Ending stocks	Mil. bu.	2,576	2,455	2,290	2,124	2,033	1,960
Price	Dol./bu.	3.30	2.68	2.71	2.82	2.98	3.11
Income indicators:							
Value of production	Mil. dol.	8,873	7,489	7,563	7,931	8,451	8,873
Deficiency payments	Mil. dol.	1,995	0	0	0	0	0
Storage payments	Mil. dol.	155	126	121	103	78	58
Diversion payments	Mil. dol.	812	0	0	0	0	0
Total gross income	Mil. dol.	11,835	7,615	7,684	8,034	8,529	8,930
Variable costs	Mil. dol.	5,026	5,283	5,291	5,325	5,376	5,417
Total net income	Mil. dol.	6,809	2,332	2,393	2,708	3,153	3,514
Net CCC outlays: ²							
Deficiency payments	Mil. dol.	1,965	0	0	0	0	0
Diversion payments	Mil. dol.	813	0	0	0	0	0
Storage payments	Mil. dol.	152	124	118	101	76	57
Net lending	Mil. dol.	804	467	326	192	115	54
Other costs	Mil. dol.	601	586	541	506	506	505
Net outlays	Mil. dol.	4,336	1,177	985	799	697	616
Consumer expenditures ³	Mil. dol.	37,776	37,376	37,390	37,466	37,570	37,653

¹ Unless indicated otherwise, numbers are averages for the 6 crop years, 1986/87–1991/92.

² Fiscal year 1987–91 averages.

³ Consumer expenditures for bakery products.

income and program costs to sharply decline. However, if deficiency payments are continued while voluntary production controls are eliminated, producers' incomes are maintained, but CCC outlays increase. The fourth option maintains loan rates and target prices at their 1985 levels, but increases the level of voluntary acreage and paid land diversion programs. Producers would be required to idle 30 percent of their acreage base and divert an additional 20 percent (for a payment of \$2.70 per bushel) to be eligible for deficiency payments.

The fourth option results in higher farm prices of \$0.06–\$0.20 per bushel (table 5). Net income would increase moderately if exports are inelastic, but would decline moderately if exports are elastic. Overall, farm income remains relatively unchanged because lower

deficiency payments resulting from higher prices are offset by larger diversion payments.

CCC net outlays remain at about \$4 billion per year. Maximum taxpayer savings of only about \$430 million annually seem possible under the fourth option. Consumer expenditures for bakery products increase by \$38–\$127 million per year. The fourth program option would change farm income little while moderately decreasing taxpayer costs and slightly raising consumer expenditures.

Conclusions

The results of these simulations, in comparison with continuing the 1985 wheat program, suggest that two of

Table 5—Option 4: Expand voluntary acreage programs¹

Item	Unit	Baseline	Export elasticity				
			- 0.25	- 0.50	- 1.00	- 2.00	- 4.00
Acreage planted	Mil. ac.	72.2	67.5	67.2	66.9	66.5	66.2
Acreage harvested	Mil. ac.	64.9	60.7	60.5	60.2	59.8	59.5
Yield per acre	Bu./ac.	41.4	42.6	42.6	42.7	42.8	42.9
Supply:							
Beginning stocks	Mil. bu.	2,309	2,157	2,182	2,199	2,217	2,232
Production	Mil. bu.	2,689	2,583	2,578	2,568	2,558	2,548
Imports	Mil. bu.	3	3	3	3	3	3
Total	Mil. bu.	5,001	4,744	4,763	4,770	4,778	4,784
Use:							
Food and industrial	Mil. bu.	683	681	681	681	682	682
Seed	Mil. bu.	91	85	85	84	84	83
Feed	Mil. bu.	264	242	244	249	253	257
Exports	Mil. bu.	1,387	1,367	1,350	1,329	1,307	1,287
Total	Mil. bu.	2,425	2,374	2,360	2,343	2,326	2,310
Ending stocks	Mil. bu.	2,576	2,369	2,403	2,427	2,452	2,474
Price	Dol./bu.	3.30	3.50	3.48	3.44	3.40	3.36
Income indicators:							
Value of production	Mil. dol.	8,873	9,036	8,965	8,830	8,685	8,561
Deficiency payments	Mil. dol.	1,995	1,143	1,177	1,245	1,319	1,382
Storage payments	Mil. dol.	155	131	134	138	144	148
Diversion payments	Mil. dol.	812	1,388	1,400	1,420	1,442	1,461
Total gross income	Mil. dol.	11,835	11,699	11,676	11,634	11,590	11,553
Variable costs	Mil. dol.	5,026	4,832	4,822	4,805	4,786	4,769
Total net income	Mil. dol.	6,809	6,866	6,854	6,829	6,804	6,783
Net CCC outlays: ²							
Deficiency payments	Mil. dol.	1,965	1,135	1,170	1,234	1,305	1,365
Diversion payments	Mil. dol.	813	1,378	1,391	1,414	1,438	1,460
Storage payments	Mil. dol.	152	129	131	136	141	145
Net lending	Mil. dol.	804	679	703	725	748	769
Other costs	Mil. dol.	601	586	594	596	598	599
Net outlays	Mil. dol.	4,336	3,906	3,990	4,105	4,230	4,338
Consumer expenditures ³	Mil. dol.	37,776	37,903	37,891	37,865	37,838	37,814

¹ Unless indicated otherwise, numbers are averages for the 6 crop years, 1986/87–1991/92.

² Fiscal year 1987–91 averages.

³ Consumer expenditures for bakery products.

the options are politically unrealistic. Eliminating deficiency payments and acreage programs with a lower loan rate is unlikely because farm income would be affected adversely (table 6). Maintaining target prices at their 1985 level while eliminating acreage controls and lowering loan rates is also unlikely because farm program costs would increase greatly.

The two remaining policy options are more realistic because they control taxpayer and consumer costs while maintaining farm income. But both these options, lowering the loan rate while maintaining target price protection and expanding voluntary acreage and paid land diversion programs, fail to substantially reduce

program costs. Assumptions regarding the responsiveness of exports to changes in price appear not to greatly affect these findings. Thus, the only way to substantially reduce the cost of the wheat program seems to be to reduce income support to wheat farmers.

The Food Security Act of 1985 reduced loan rates and expanded voluntary acreage programs. Pressure to reduce program costs also led to discretionary authority to freeze program yields at historical levels, changing the method of calculating base acreages, basing deficiency payments on season-average prices, and cutting target prices—all of which lower direct payments and farm income.

Table 6—Quantitative effects of policy options¹

Option	Export elasticity	
	- 0.25	- 4.00
	<i>Million dollars</i>	
Lower loan rate:		
Net farm income	+ 100	- 81
CCC outlays	+ 473	- 611
Consumer expenditures	- 258	- 67
Lower loan rate, no acreage programs:		
Net farm income	+ 1,034	+ 1,086
CCC outlays	+ 3,405	+ 784
Consumer expenditures	- 521	- 195
Lower loan rate, no acreage programs, and no deficiency payments:		
Net farm income	- 4,477	- 3,295
CCC outlays	- 3,159	- 3,720
Consumer expenditures	- 401	- 123
Expand acreage programs:		
Net farm income	+ 57	- 26
CCC outlays	- 430	+ 2
Consumer expenditures	+ 127	+ 38

¹ Annual average change from baseline.

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In Earlier Issues

[T]he application of scientific principles to the use of mail surveys would probably strengthen such surveys to the point where they would yield just as accurate results as do enumerative surveys. This is not an attempt to minimize the importance of enumerative surveys in an over-all statistical program. . . . It means, however, that a mail survey should be planned with as much attention to scientific principles as an enumerative survey. When that is done, the mail approach can be expected to yield satisfactory results in many situations in which its use has seemed undesirable.

Walter A. Hendricks
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Trade Effects of U.S. Commodity Programs

James A. Zellner

Abstract. *The acreage reduction requirements in the 1986 wheat and corn programs more than offset the subsidy effects of the target price/deficiency payment portion of the programs. Target prices and deficiency payments affect world markets much like direct export subsidies, and acreage reduction requirements affect markets like an export tax. This article estimates export subsidy and tax equivalents of commodity price and income support programs for wheat and corn. The 1986 crop-year programs were equivalent to imposing substantial export taxes, although the level of implicit tax was reduced by about half compared with the 1985 crop-year programs.*

Keywords. *Export subsidy, export tax, direct payments, target prices, acreage reduction.*

An income supplement program, where the payment is tied closely to the quantity of the commodity produced, increases domestic production because producers respond to the payment rather than to the market price. The Food and Consumer Protection Act of 1973 introduced the concept of deficiency payments. Rather than setting direct payments equal to a fixed sum as during the sixties, the 1973 Act made payments variable, increasing when prices declined, decreasing when prices rose, and disappearing when prices exceeded established target price levels. All farm legislation since 1973 has included a target price/deficiency payment for wheat, feed grains, rice, and cotton.

The commodity programs that use target prices and deficiency payments are designed to protect farm income while allowing loan rates to be reduced to market levels. However, with a simple world trade model, one can demonstrate that such a program can induce expanded production, leading to a larger excess supply. (6).¹ Such a program lowers world prices and boosts the market share of the country paying the income subsidy. Thus, the payment may be viewed, as it has been by the

European Community and Canada, as operating in much the same way as would an export subsidy on the commodity. The Ontario Corn Growers Association recently filed a countervailing duty case against corn imports from the United States, charging that the United States was, through its farm support programs, subsidizing exports of corn. A country's requirement that acreage be reduced or its imposition of a price-support loan above market-clearing prices affects markets in the same way as would an export tax on the commodity. The results of this analysis suggest that, contrary to the Ontario Corn Growers' position, the U.S. program actually acts as a significant export tax on corn.

The U.S. Government has used direct export subsidies, although the Constitution specifically prohibits direct taxation of exports. The use of the terms "subsidy equivalent" or "tax equivalent" in this article should not be confused with these other tools. Rather, they are simply the estimates of the subsidy or tax which, if imposed directly, would affect U.S. exports and excess domestic supply of wheat and corn in the same way.

In this article, I estimate the net export subsidy/tax equivalent effects of the total program, including target price/deficiency payment, acreage reduction, and loan rates in effect for the 1986-87 crop year for U.S. wheat and corn producers. I show that the Food Security Act of 1985 influenced the magnitude of the export subsidy/tax equivalents.

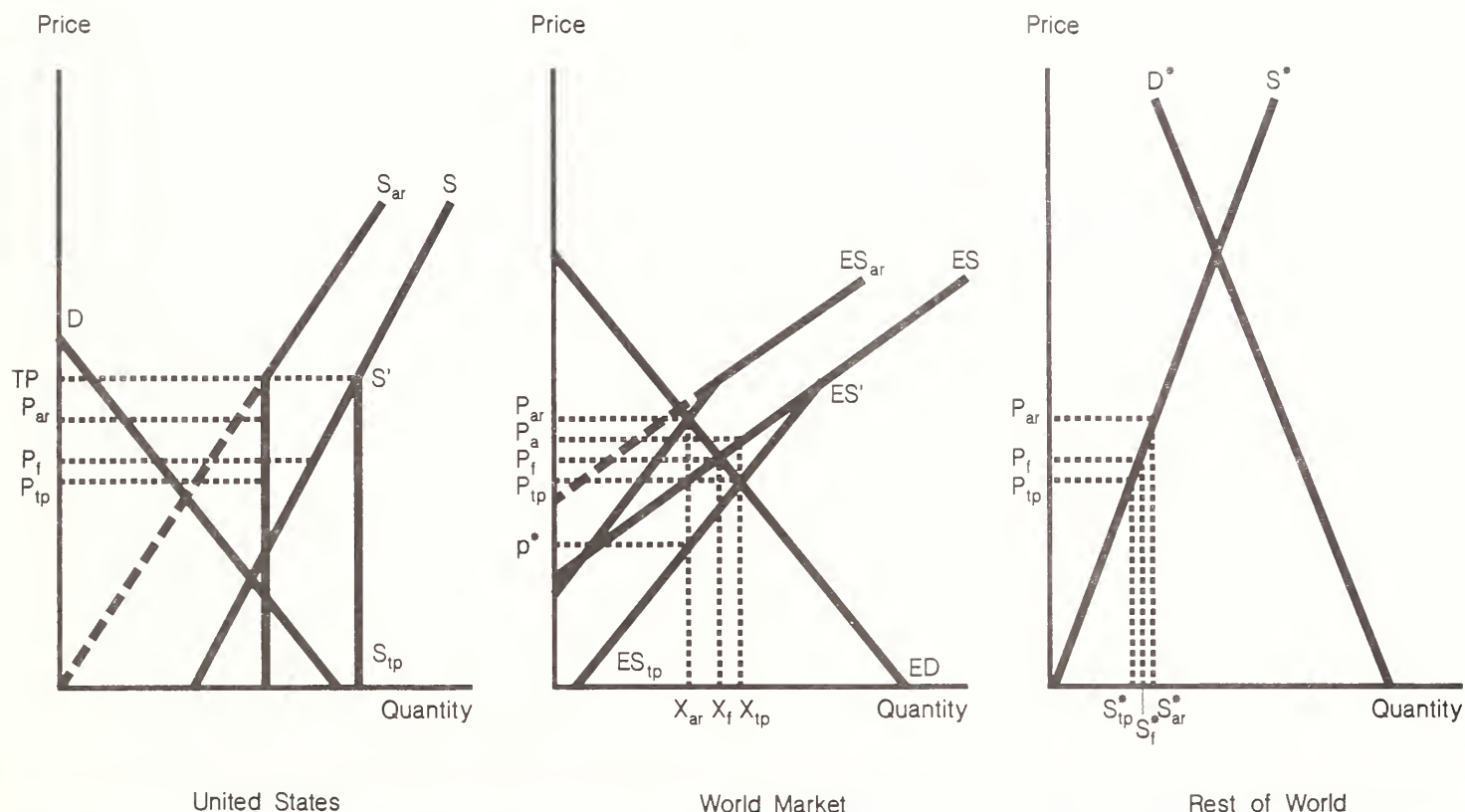
Figure 1 shows a two-country, single-commodity model where both countries initially trade in a freely competitive market. World market supply equals the excess supply of the exporting country (ES), or total supply (S) less domestic demand (D). (See panel 1.) Demand in the world market is determined by the excess demand of the importing country (ED), or importing country domestic demand less importing country domestic supply. (See panel 3.) Price (P_f) and the quantity traded (X_f) are determined in the world market.

The figure also illustrates what occurs if the exporting country (in this case the United States) distorts the free trade equilibrium by establishing a guaranteed mini-

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¹ Italicized numbers in parentheses refer to items in the References at the end of this article.

Free trade model for a single commodity



imum expected price, that is, a target price (TP). Domestic supply becomes $S_{tp}S'S$, and excess supply in the world market shifts outward to $ES_{tp}ES'S$, resulting in larger exports (X_{tp}) and a lower world price (P_{tp}). Supply in the rest of the world falls from S_{f^*} to S_{tp}^* , implying a larger market share for the exporting country. The effect would be the same as if the exporting country paid an export subsidy of $P_a - P_{tp}$ per unit.

The analysis of U.S. commodity programs is less straightforward. In 7 of 13 years since crop year 1974, corn and wheat producers were required to idle some acreage to be eligible for deficiency payments. In all but 1 of those 7 years, wheat farmers received diversion payments for some of the idled acreage, further increasing their incentive to reduce acreage. Corn producers received cash or in-kind diversion payments in all but two of the years. Such acreage reductions correspondingly reduce supply, which increases price and at least partially offsets the implicit export subsidy.

In the figure, panel 1, supply shifts inward to S_{ar} , reflecting the requirement to idle acreage. The exact shape of the domestic supply curve in the face of an acreage reduction requirement cannot be determined *a*

priori. The curve will probably shift less when the expected price is high than when it is low because U.S. programs are voluntary and because a high expected price makes the programs less attractive. Excess supply would shift inward to ES_{ar} , and price would rise above the free market price (see figure). Some producers would participate even when the expected price exceeds the target price, perhaps as a form of insurance. At high expected prices some, although probably proportionally less, acreage may be idled, suggesting either a nonlinear supply or a kink at or near TP . The figure is constructed to show both increasing participation at lower prices and a kink at the target price. Paarlberg and others (6) construct a similar diagram with a parallel shift in domestic and excess supply, implicitly assuming that expected program returns relative to expected market returns have no bearing on the participation decision, an assumption that makes diagrammatics simpler but that is, in fact, unrealistic and unsupported.

The exact effect on production of acreage reduction requirements versus deficiency payments can only be determined empirically. Hence, the amount of the shift as illustrated in the figure is arbitrary. If the relation-

ship is nonlinear, or kinked as suggested above, the acreage restriction could shift supply less in the relevant price range, such that the negative production effects of the acreage reduction requirement would be more than offset by the positive effects of the target price/deficiency payment program.

Another element of the farm commodity program, the price-support loan, is not illustrated in figure 1. Readers can consult Paarlberg for an illustration of the program including the price-support loan (6).

The Effect of Slippage

One factor that makes the net effect of contemporary programs uncertain is slippage. Slippage is apparent when farmers are required to idle a certain percentage of their acreage and when total acreage planted falls by less than idled acreage. Slippage is also apparent when production falls by less than the percentage implied by the acreage reduction program.

Slippage results from two basic situations. First, farmers who participate in the program will generally idle their least productive land. Because only land is idled, they are free to increase the use of other inputs on the land remaining in production. These forces tend to increase average yields substantially on the land that remains in production. Second, farmers who do not participate in the program, or producers with more than one farm who choose not to participate on all their farms, can expect the acreage reduction program to boost prices. Hence, with higher expected prices they have an incentive to expand acreage, which at least partially offsets the intent of the acreage-idling requirement.

Measuring the Subsidy or Tax Equivalent

The figure also illustrates how one can calculate the implicit export subsidy or tax equivalents of various programs. If only a target price is in effect, with no requirement for acreage reduction, the new world market price and quantity are P_{tp} and X_{tp} , respectively. To generate an excess supply of X_{tp} without a target price, a price of P_a would be required. Hence, the difference between P_a and P_{tp} would be the level of export subsidy required to generate the extra production and to move it onto the world market. In effect, we can view the implicit subsidy as the wedge between what the producer receives (P_a) and the importing country pays (P_{tp}).

In the figure we also observe that X_{ar} is sold at price P_{ar} when an acreage reduction requirement is in effect. That quantity would be produced in a free market at a

price of P^* ; hence, an export tax equal to $(P_{ar} - P^*)$ would be required to yield the market result illustrated. Such a tax would be required to reduce both exports and excess supply to X_{ar} . Again, the tax can be measured as the wedge between the price the importing country pays (P_{ar}) and the price the producer receives (P^*). In the empirical analysis to follow, the subsidy and tax equivalents of the various programs are calculated in a similar manner. I substituted the equilibrium quantity into the estimated "no program" supply curve to determine the corresponding no program price. I compared that price with the price resulting from the program under consideration, the difference being either the equivalent export tax or the subsidy generated by the program.

Note that the equivalent export tax or subsidy of the program does not equal the smaller price change required just to change exports. The export tax or subsidy must be large enough to force the necessary adjustment in excess supply (via production and domestic demand) as well. Thus, although in the case of the export subsidy illustrated above, exports rose from X_f to X_{tp} , which could occur if price falls from P_f to P_{tp} , that change alone would not induce production and, hence, excess supply to expand. To induce an excess supply of X_{tp} , a price of P_a would have to prevail in the domestic market; hence, the export subsidy equivalent is $P_a - P_{tp}$.

Likewise, if an export tax were used to reduce exports to X_{ar} , the tax would need to be large enough to reduce excess supply to that level. Although raising the price from P_f to P_{ar} could cut exports to X_{ar} , the price in the domestic market must fall to P^* to restrict excess supply to X_{ar} . Hence, the export tax, or wedge between the export price and domestic price, would have to equal $P_{ar} - P^*$.

Modeling Production and Slippage

Economists have used several approaches to incorporate the voluntary nature of the U.S. program into agricultural sector models. Houck and Ryan (4), Gallagher and Green (3), and Langley (5) used market and program returns to improve estimates of production response. Bancroft (1) developed a model relying on net returns from the program and the market to endogenously predict the level of farmer participation in commodity programs. Salathe and others (7) incorporated the latter approach in developing the U.S. Department of Agriculture's (USDA) Food and Agricultural Policy Simulator (FAPSIM) model of the agricultural sector.

FAPSIM's wheat and corn components were used to estimate the program's effects on implicit export subsi-

dies and/or export taxes. The acreage response relationships in FAPSIM reflect the relative profitability of participation in Government programs. (See the appendix for a more detailed description of the production, yield response, and participation equations contained in FAPSIM.) The model also accounts for slippage due to increased nonparticipant planting by incorporating acreage planted by participants as one determinant of nonparticipant plantings. Such slippage for wheat is estimated at 0.33 ($t = 5.32$); that is, for each acre idled by participants, nonparticipants increase planting by a third of an acre. Corn acreage slippage is 0.40 ($t = 12.09$). The model accounts for yield slippage by incorporating acreage planted and program acreage in the yield equation. Wheat yield increases by 0.13 ($t = 3.53$) bushels per acre for each 1 million idled wheat acres. Corn yield slippage is 0.47 ($t = 3.57$) (2).

The FAPSIM wheat and corn sector equations, which Gadson and others document (2), were extracted and set up as separate models to estimate the production and export subsidy/tax effects of current U.S. farm programs. The base case was the “no program” excess supply and excess demand. I estimated the base case excess supply by simulating wheat and corn production and domestic demand for several price levels. These results were then used to construct an excess supply curve for wheat and corn. Excess supply curves were also generated for the case where production and export subsidy equivalents would be the largest: a target price of \$4.38 per bushel for wheat and \$3.03 per bushel for corn, with no requirement for acreage reduction. Finally, I examined two contemporary cases. An excess supply curve was generated after I imposed the actual 1985 crop-year programs for wheat and corn, based on the Food and Agriculture Act of 1981 and another program for the actual 1986 crop-year programs, based on the Food Security Act of 1985. One can use these two cases to evaluate the effects of the 1985 Act on potential and actual export subsidy/tax equivalents for wheat and corn.

The procedure was straightforward. I introduced various expected prices into the production side of the models, given the above-mentioned program assumptions. For each price a production level was generated. For each price a domestic (food, feed, and seed) quantity demanded was also generated which, when subtracted from production, yielded excess supply. Government stocks were assumed to be fixed except when the price-support loan was in effect. Free stocks were price-responsive, consistent with FAPSIM. Excess demand was the export demand contained in the FAPSIM model with all variables except price held constant.

Calculating the Subsidy and Tax Equivalents

Table 1 contains the slope and intercept terms for the four linear excess supply curves for wheat representing the actual 1986 crop-year program based on the Food Security Act of 1985, the 1985 crop-year program based on the Food and Agricultural Act of 1981, the “no program” excess supply, and the excess supply that would exist if the program included only a target price of \$4.38 per bushel with no requirement for acreage reduction. The excess demand curve reported in table 1 is the wheat export demand taken from FAPSIM, with all factors except price held constant. Also reported are the prices, quantities, and implicit export subsidies or taxes associated with each program alternative.

The “no program” equilibrium price and quantity are \$1.51 and 1.31 billion bushels, respectively. When one introduces a \$4.38 target price without requiring acreage reduction, the equilibrium price falls to \$0.65 and the quantity rises to 1.511 billion bushels. An equivalent export subsidy of \$1.56 per bushel would have to be paid to raise both excess supply and exports to this level. It is calculated as follows: It takes a domestic price of \$2.21 per bushel to generate an excess supply of 1.511 billion bushels and an export price of \$0.65 per bushel to sell this quantity to importing countries. The difference ($\$2.21 - \$0.65 = \$1.56$) is the export subsidy necessary to achieve the same results as a target price only program.

When the 1985 program is introduced, assuming no minimum loan rate or support price, the price rises to \$1.93 per bushel and exports fall to 1.211 billion bushels. That program is equivalent to an export tax of \$0.78 per bushel. The equivalent export tax is computed in the same manner as the export subsidy. A domestic price of \$1.15 is required to generate an excess supply of 1.211 billion bushels. An export price of \$1.93 is required to restrict exports to that level. The difference ($\$1.93 - \$1.15 = \$0.78$) is the export tax required to achieve the same results as the 1985 program. The 1986 program, based on the Food Security Act of 1985, requires a larger acreage reduction. Thus, the export tax equivalent would be even higher, \$0.91 per bushel, as it would raise the price to \$2.00 and restrict exports to 1.194 billion bushels. The effect on production of the conservation reserve, also included in the 1985 Act, was inconsequential for the 1986 wheat and corn crops. However, it will become more significant and increase implicit export taxes, other things being equal.

The actual 1985 and 1986 crop-year programs for wheat included price-support loan rates above market-clearing levels. The 1985 program loan rate was \$3.30 per bushel.

Table 1—Wheat: Estimates of tax and subsidy equivalents

Item	Unit	No program	Target price only	1985 program	1986 program
Agricultural programs:					
Target price	Dollars/bushel	—	4.38	4.38	4.38
ARP	Percent	—	—	.20	.225
PLD	Percent	—	—	.10	.125
Loan rate	Dollars/bushel	—	—	3.30	2.30
Excess supply equation:					
Slope	—	282.905	171.667	327.190	336.119
Intercept	1,000 bushels	884.560	1,399.580	579.631	521.988
Excess demand equation:					
Slope	—	- 235.000	- 235.000	- 235.000	- 235.000
Intercept	1,000 bushels	1,664.000	1,664.000	1,664.000	1,664.000
World price:	Dollars/bushel	1.51	0.65	1.93	2.00
U.S. exports:					
Without loan	1,000 bushels	1,310	1,511	1,211	1,194
With loan	1,000 bushels	—	—	889	1,124
Export subsidy (tax) equivalent:					
Without loan	Dollars/bushel	0	1.56	(0.78)	(0.91)
With loan	Dollars/bushel	—	—	(3.28)	(1.46)

ARP = Acreage reduction program.

PLD = Paid land diversion.

— = Not applicable.

At that level exports would be restricted to an estimated 889 million bushels. The equivalent export taxes necessary to reduce excess supply and exports to 889 million bushels, if producers faced a “no program” market, would be \$3.28 per bushel. The 1986 program reduced the loan rate to \$2.30 per bushel, after the enactment of the Balanced Budget and Emergency Deficit Control Act of 1985 (Graham, Rudman, Hollings). This loan rate would still set the market price floor, but would allow exports to rise to 1.124 billion bushels. Although less than half the 1985 program, the equivalent export tax implied by the 1986 program is \$1.46 per bushel.

Table 2 contains the slope and intercept terms for the four linear excess supply curves for corn representing the 1986 crop-year program based on the 1985 Act, the 1985 crop-year program based on the 1981 Act, the “no program” excess supply, and the excess supply that would exist if the program included only a target price of \$3.03 with no requirement to reduce acreage. As with wheat, excess demand is the corn export demand from FAPSIM, with all factors but price held constant. Also reported are the prices, quantities, and implicit export subsidies or taxes associated with each program alternative.

The “no program” equilibrium price and quantity are \$1.47 and 1.788 billion bushels. With only a target price and no requirement for acreage reduction, the price falls to \$0.75 and exports rise to 2.062 billion bushels. An implicit export subsidy of \$0.94 would be required to increase excess supply and exports to that level. The programs derived from the 1981 and 1985 acts have similar effects except for the loan rates. Each required an acreage reduction; however, the 1985 Act and the subsequent Balanced Budget and Emergency Deficit Control Act of 1985 allowed the loan rate to be reduced from \$2.55 to \$1.84. The 1985 program based on the 1981 Act resulted in a price of \$1.85 per bushel and exports of 1.645 billion bushels, assuming no price-support loan. The equivalent export tax required to reduce excess supply and exports to that level would be \$0.49 per bushel. However, with a \$2.55 loan rate, exports would fall to only 1.378 billion bushels, implying an export tax of \$1.40. For the 1986 program, based on the 1985 Act, however, the price would be \$1.94 per bushel and exports would be 1.609 billion bushels. An implicit export tax of \$0.61 per bushel would be necessary to reduce excess supply and exports to that level. Because the loan rate was below the market price resulting from the acreage reduction, it would not add more to the implicit export tax.

Table 2—Corn: Estimates of tax and subsidy equivalents

Item	Unit	No program	Target price only	1985 program	1986 program
Agricultural programs:					
Target price	Dollars/bushel	—	3.03	3.03	3.03
ARP	Percent	—	—	.10	.175
PLD	Percent	—	—	—	.025
Loan rate	Dollars/bushel	—	—	2.55	1.84
Excess supply equation:					
Slope	—	1,282.88	845.786	1,489.33	1,608.62
Intercept	1,000 bushels	—98.107	1,434.36	—1,086.00	—1,512.89
Excess demand equation:					
Slope	—	—380.000	—380.000	—380.000	—380.000
Intercept	1,000 bushels	2,347.000	2,347.000	2,347.000	2,347.000
World price:	Dollars/bushel	1.47	0.75	1.85	1.94
U.S. exports:					
Without loan	1,000 bushels	1,788	2,062	1,645	1,609
With loan	1,000 bushels	—	—	1,378	¹
Export subsidy (tax) equivalent:					
Without loan	Dollars/bushel	0	0.94	(0.49)	(0.61)
With loan	Dollars/bushel	—	—	(1.40)	(0.61)

ARP = Acreage reduction program.

PLD = Paid land diversion.

— = Not applicable.

¹ Loan rate is below market price; hence, loan is an ineffective floor price.

Note that all the equations in FAPSIM are linear. Many points at lower price levels on the “no program” excess supply curve that were used to calculate the equivalent export taxes represent out-of-sample observations. The excess supply curve would probably be nonlinear at very low price levels, making the equivalent export taxes somewhat smaller than those estimated here.

Policy Implications

For the current program to be a true subsidy as is often alleged, a combination of changes would be required that would allow the market price to fall below the “no program” price estimated at \$1.51 per bushel for wheat or \$1.47 per bushel for corn. It would be necessary to retain the target price and deficiency payment program, although not necessarily at the same level, and to further reduce the loan rate, either by lowering the price-support loan or by using some form of marketing loan. Some easing of the acreage reduction requirement or a relaxation of the rules so that greater slippage could occur would also be necessary.

The Ontario Corn Growers Association charged that corn imports from the United States were being subsidized through the U.S. farm support programs. The

analysis here suggests that, on the contrary, the current program acts as a significant export tax on corn equal to about 31 percent of the market price. However, the implicit tax on corn is \$0.79 per bushel lower because of the changes made by the Food Security Act of 1985, the Balanced Budget and Deficit Control Act of 1985, and the 1986 crop-year program. If the 1985 crop-year program were in effect, the equivalent export tax would be about 55 percent of the market price of corn. The significant difference in the magnitude of the implicit export tax would help explain why Canadian producers have felt injured and why they have been under increased pressure since passage of the 1985 Act.

Appendix

USDA's FAPSIM model is well suited to estimating the net effects of domestic programs on the excess supply facing world markets because program participation, and particularly slippage, heavily influence whether the program acts as an export subsidy or an export tax. FAPSIM uses an approach that endogenously determines the planted acreage both inside the program and outside the program. The equation is based on the historical relationship between participation and expected net returns from program participation and from

the market. The participation relationship captures the effect of slippage due to additional acreage planted by nonparticipants.

Expected net return from participating or from not participating is an important component of the farmer's decision. For a program participant, the expected net per-acre return for crop i is:

$$\begin{aligned} EPR_i = & [(EPP_i * EY_i - VC_i)(1.0 - (ARP_i + PLD_i))] \\ & + [SR_i * PY_i (1.0 - (ARP_i + PLD_i))] \\ & + [DR_i * PY_i * PLD_i] \end{aligned} \quad (1)$$

where:

- EPR_i = expected program net return per acre for crop i ,
- EPP_i = maximum of the loan rate and the expected market price,
- EY_i = expected yield per acre,
- VC_i = variable cost per acre,
- SR_i = expected deficiency payment rate (target price less maximum of expected market price or loan rate) per bushel,
- PY_i = national program yield,
- ARP_i = proportion of each acre in unpaid acreage reduction,
- PLD_i = proportion of each acre in paid land diversion, and
- DR_i = diversion payment rate per bushel.

The expected net return per acre for nonparticipants is:

$$EMR_i = EMP_i * EY_i - VC_i$$

where:

- EMR_i = expected market net return per acre for crop i ,
- EMP_i = expected market price for crop i , and
- EY_i, VC_i defined as above.

Expected crop prices are based on the simple average price 1-5 months prior to planting, and expected crop yields are obtained by regression of actual yields on time.

The expected net return variables are used to estimate acreage response by participants and nonparticipants. Acreage planted in the program is expressed as:

$$PA_i = f[EPR_i, EMR_i, APP_i, (1 - ARP_i - PLD_i)] \quad (3)$$

where:

- PA_i = program acreage of crop i ,
- APP_i = average expected net return of competing crops,
- ARP_i = acreage reduction percentage for crop i , and
- PLD_i = paid land diversion percentage for crop i .

The slippage is accounted for in the acreage planted equation for nonparticipants, which is a function of acreage planted to the crop by participants, acreage set aside and diverted, the real expected net return from competing crops, and the real expected market net return from planting crop i .

The model also incorporates yield equations that are a function of, among other things, the planted acreage both inside and outside the program. Incorporation of planted acreage into the yield equations takes into account the common practice of retiring the least productive land first when an acreage reduction program is in effect, and that factors of production other than land are not controlled.

The yield equation is expressed as:

$$YLD = f(\text{TIME}, \text{IDLE}, \text{PLANT}) \quad (4)$$

where:

- YLD = yield per acre,
- $IDLE$ = acreage idled by program participants,
- $PLANT$ = total planted acreage, and
- $TIME$ = a time trend.

The complete set of equations and summary statistics appear in (2).

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In Earlier Issues

New work, like that reported in this article, conducted under the Occupation in two hemispheres, is giving BAE a chance to observe the effectiveness of modern sampling techniques.

How complete is a "complete" census? . . . [T]he Japanese Crop Reporting Service, newly organized, has a more specific answer. . . . Incompleteness proved to be of two kinds: (1) nonreporting of fields in these crops and (2) understatement of the area of the fields reported.

A measure of bias to nonreporting of hitsu was obtained from a sample of some 37,000 koaza in which all the hitsu in the specified crops reported by farmers in the census were checked by the Branch Crop Reporting Offices against the plot maps in the land ledger, and the area of nonreported hitsu was estimated through inspection, usually by taking the area of the hitsu as recorded in the land ledger. A measure of bias due to understatement of the area in the specified crops as reported by the farmers on the census was obtained from a randomly selected subsample of hitsu within the sample koaza. These 70,000 subsample hitsu were actually measured by plane table surveying methods.

Charles F. Sarle
Vol. 1, No. 2, Apr. 1949

Comments

Export Policy, Deficiency Payments, and a Consumption Tax

Bruce Gardner

Agricultural economists in recent years have made progress in linking policy objectives to the optimal design of programs (4, 7).¹ Consider the problem of agricultural policy design such that the distributive effects among three groups—producers, consumers, and taxpayers—are taken into account. With different weights attached to different groups (for example, more weight for farmers because their industry is depressed, or added weight for tax expenditures because of the high Federal budget deficit), we need to revise some standard welfare results. This article considers a particular problem of policy choice, the use of an export subsidy compared with alternative means of agricultural price supports, and develops further the analysis by Gardner (3) and Paarlberg (5, 6). A numerical example and a more general algebraic formula show that a combination of direct producer payments and consumption taxes is preferable to an export subsidy. The formula also generates the welfare-maximizing payment and tax rates for alternative weights on producers, consumers, and taxpayers.

Numerical Example

Consider a country facing a perfectly elastic demand for its exports at a given world price. The figure shows an export subsidy program. The kinked curve, DD, is the total demand for the country's output, with the downward sloping segment being domestic demand and export demand being the flat segment at the world trading price, P_w . The line S represents the country's supply, which exceeds demand at price P_w . With no program, the domestic market price would be P_w (\$2 per bushel) and exports would be 3 billion bushels. Now a subsidy of s (\$1 per bushel) increases exports to $Q - Q_d$ and increases producers' price to P_p (\$3), above the world price P_w by the full amount of the subsidy. (Even if s is paid to exporting companies, competition for grain for export will place P_p at $P_w + s$.) The income redistribution compared with no program, when one uses numbers for concreteness, is given in table 1.

With equal weights assigned to the welfare of each interest group, the export subsidy reduces total welfare \$1 billion in relation to the free market solution. With producers assigned a weight of 1.2, however, the total increases by \$0.9 billion. Under these assumptions, the export subsidy is preferable to the free market.

Suppose a producer deficiency payment, rather than an export subsidy, is used to give producers a price of P_p . The calculations appear in table 2. They show that the deficiency payment program is preferable to the export subsidy, if one uses the unweighted sum of gains as a criterion. If one uses the weighted gains, both the export subsidy and deficiency payment program are preferable to the free market, but deficiency payments are still preferable to the export subsidy.

Now suppose that G_c is weighted less than G_T . For example, let the weight on consumers be reduced to 0.6. Then the new weighted sum of gains is \$1.4 billion for the deficiency payment, whereas it is \$3.1 billion for the export subsidy. Therefore, the export subsidy is preferred to the deficiency payment. The result is interesting because it violates the usual finding that purely domestic interventions are preferred to border interventions for the purpose of domestic income redistribution (1).

This is not the end of the story, however. With three different weights on three different interest groups, we generally gain by using more than one policy instrument. Some such instruments are counterproductive. For example, an export tax or a supply management program will make producers worse off since output is reduced, but the given world price does not rise (unless exports are completely choked off). In the case considered here, the appropriate instrument to add to the deficiency payment program is a domestic consumption tax. In terms of the figure, a tax equal to the payment rate, s , makes consumers pay P_p . The gains and losses are the same as those for the export subsidy. This is an instance of the general result that the effects of any export subsidy can be duplicated by use of a production subsidy and a consumption tax.

More important, with different weights on consumers and taxpayers, we can do even better by making the tax

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¹ Italicized numbers in parentheses refer to items in the References at the end of this article.

Table 1—Redistribution caused by an export subsidy

Item	Area	Unweighted average		Weighted average	
		Weight	Billion \$	Weight	Billion \$
Producers' gain (G_p)	A + B + C	1.0	9.5	1.2	11.4
Consumers' gain (G_c)	- A - B	1.0	- 5.5	1.0	- 5.5
Taxpayers' gain (G_T)	- B - C - D	1.0	- 5.0	1.0	- 5.0
Sum	- B - D	—	- 1.0	—	+ .9

— = Not applicable.

rate differ from the payment rate. In the example, suppose we raise the tax to 2s or \$2 per bushel to make the consumer price \$4. Then consumers lose a further amount $A' + B'$ and taxpayers gain a further amount A' . There is an additional deadweight (unweighted sum) loss, but the weighted sum increases. The results of the joint deficiency payment (s) and consumption tax (2s) program are shown in table 3. The weighted sum of gains is now \$3.4 billion, which is larger than the \$3.1 billion net gain for the export subsidy as calculated above.

rates for general linear domestic supply and demand functions, we have the following welfare function:

$$W = \Theta_1 G_p + \Theta_2 G_c + \Theta_3 G_T \quad (1)$$

where Θ 's are welfare weights, and G_p , G_c , and G_T are gains generated by intervention for producers, consumers, and taxpayers. G_p and G_c are the changes in consumers' and producers' surpluses caused by the subsidy and tax:

$$G_p = \int_{P_w}^{P_w+s} S(P)dP \quad (2)$$

$$G_c = - \int_{P_w}^{P_w+t} D(P)dP \quad (3)$$

Optimal Tax and Deficiency Payment Rates

Raising the consumption tax further in the example could yield still more net benefits. To find the optimal

Export subsidy compared with joint deficiency payment and consumption tax

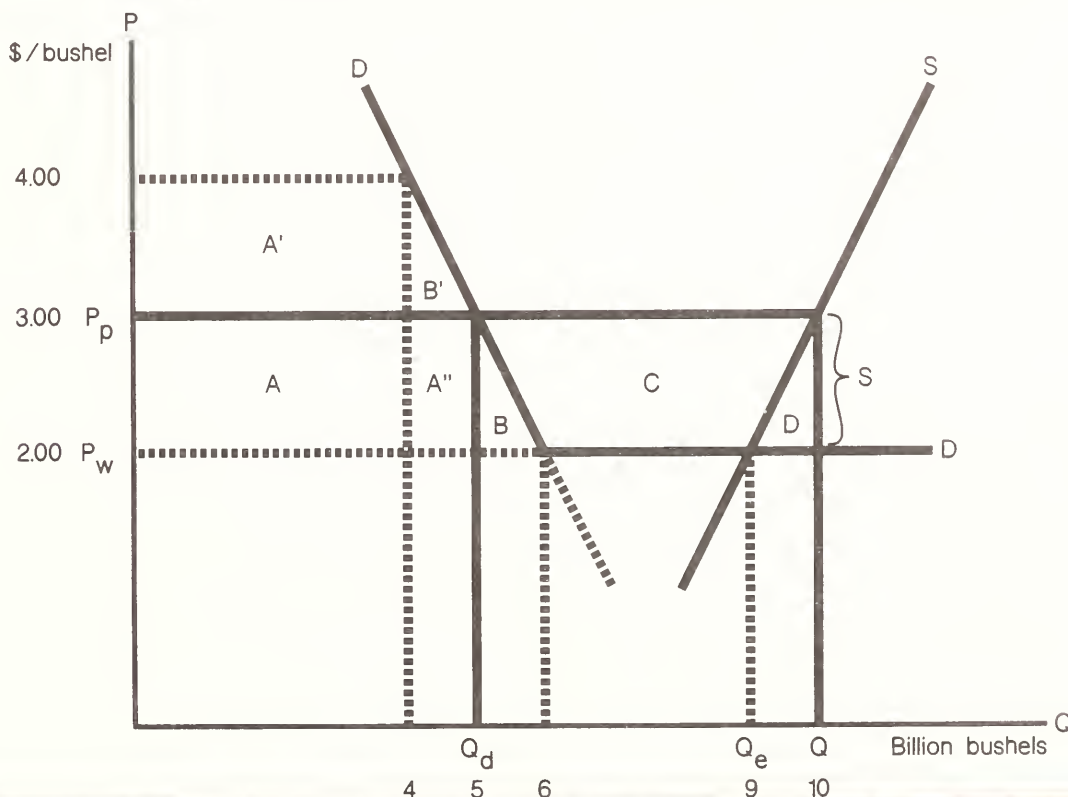


Table 2—Redistribution caused by a deficiency payment program

Item	Area	Unweighted average		Weighted average	
		Weight	Billion dollars	Weight	Billion dollars
G_p	A + B + C	1.0	9.5	1.2	11.4
G_c	- A - B - C - D	1.0	0	1.0	0
G_T	- A - B - C - D	1.0	- 10.0	1.0	- 10.0
Sum	- D	—	- .5	—	+ 1.4

— = Not applicable.

Table 3—Redistribution caused by a joint deficiency payment and consumption tax

Policy	Area	Unweighted average		Weighted average	
		Weight	Billion dollars	Weight	Billion dollars
G_p	A + B + C	1.0	9.5	1.2	11.4
G_c	- A - B - A' - B'	1.0	- 10.0	.6	- 6.0
G_T	A' - A'' - B - C - D	1.0	- 2.0	1.0	- 2.0
Sum	- B' - A'' - B - D	—	- 2.5	—	+ 3.4

— = Not applicable.

$$G_T = tD(P_w + t) - sS(P_w + s) \quad (4)$$

where P_w is the given world price, s and t are the payment and tax per unit of output, and $S(P)$ and $D(P)$ are the supply and demand functions:

$$S(P) = a_0 + a_1(P_w + s) \quad (5)$$

$$D(P) = b_0 + b_1(P_w + t) \quad (6)$$

Substituting equations 5 and 6 into equations 2 and 3, we have:

$$G_p = s[a_0 + a_1(P_w + 1/2 s)] \quad (7)$$

$$G_c = -t[b_0 + b_1(P_w + 1/2 t)] \quad (8)$$

and for taxpayers, we have:

$$G_T = t[b_0 + b_1(P_w + t)] - s[a_0 + a_1(P_w + s)] \quad (9)$$

If one substitutes equations 7, 8, and 9 into equation 1, the first-order conditions for the optimal s and t are:

$$\begin{aligned} \frac{\partial W}{\partial s} &= \Theta_1[a_0 + a_1(P_w + s^*)] - \\ &\Theta_3[a_0 + a_1(P_w + 2s^*)] = 0 \end{aligned} \quad (10)$$

$$\frac{\partial W}{\partial t} = -\Theta_2[b_0 + b_1(P_w + t^*)] +$$

$$\Theta_3[b_0 + b_1(P_w + 2t^*)] = 0 \quad (11)$$

where s^* and t^* are the optimizing values of s and t . Because only relative political weights matter, we can without loss of generality divide equations 10 and 11 by Θ_3 , which is equivalent to setting $\Theta_3 = 1$. In the numerical example of the figure, we have $a_0 = 7$, $a_1 = 1$, $b_0 = 8$, $b_1 = -1$, $P_w = 2$, $\Theta_1 = 1.2$, and $\Theta_2 = 0.6$. With these parameter values, equations 10 and 11 yield $s^* = 2.25$ and $t^* = 1.71$.

Conclusions

The economic sense of these results can be restated as follows. If reducing Government expenditures has a higher political weight per dollar than reducing consumers' costs and if one wants to support the price received by producers, an export subsidy can be a socially beneficial policy. But a joint tax on domestic consumption and a payment program for producers is better still because it can both reduce Government outlays and raise revenues through the tax.

In the case of the large country, which is relevant for U.S. grain policy at least in the short run, the situation is different because taxing exports or restricting output may dominate any of the policies considered here.²

² Domestic interventions analogous to those discussed here can avoid the unconstitutionality of the export tax by imposing a joint domestic consumer subsidy and producer tax.

However, if one compares domestic tax and payment with export subsidy policies, the former is preferred even more in the case of the large country than in the case of the small country. In the case of the large country an export subsidy involves an additional transfer in favor of foreign consumers who buy at the subsidized price over and above their gains from a deficiency payment program (2). So long as foreigners have a smaller political weight in the United States than any U.S. interest group has, the large country case makes an export subsidy still less desirable.

If equations 10 and 11 yield $t^* = s^*$, then the optimal tax and payment policy is equivalent to an export subsidy at level s^* . But this outcome requires special combinations of parameter values. Other notable special cases are: (1) if $\Theta_2 = \Theta_3$, that is, consumers and taxpayers have equal weights, then $t^* = 0$, and we have a producers' subsidy only; and (2) if $\Theta_1 = \Theta_2 = \Theta_3$, then $t^* = 0$, and $s^* = 0$; that is, the free market is optimal.

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In Earlier Issues

Traditionally the size of the pig crop has been estimated semi-annually by the Bureau of Agricultural Economics. . . . Agricultural interests have long wanted more frequent estimates of sows farrowed.

A recapitulation of the costs on the Iowa project shows that 248 hours of clerical time were involved in setting up the master control sheets for the group of 1,773 crop reporters. This includes time used in typing names and headings on sheets, locating the respondent on census rolls, drawing off control data, and computing State and district averages for control items. Listing and comparable summarization of the monthly survey results have taken from 8 to 10 hours of clerical time for each monthly compilation and from 3 to 4 hours of a statistician's time to edit the data.

Robert Overton
Vol. 1, No. 3, July 1949

The Reviewer's Craft

Judith Latham

What makes a good book review? What makes lively reading? And why do some reviews flop? How can a reviewer craft a review to capture the essence of a book and at the same time hold the reader's interest? Every prospective reviewer has posed, or should pose, such questions.

The Preliminaries: Your Audience and Purpose

The cardinal rule is to focus first on the *audience*. Imagine a real person who will be reading your review. For example, at this moment I'm trying to visualize a reader who is a prospective book reviewer for *The Journal of Agricultural Economics Research*. What would you, the reviewer, most want to know? What guidelines would help you most as you plan your review, or even before you read the book you intend to review? What should you do, and what should you not do? What questions should you ask yourself?

Who are your readers? Most, but not all, are knowledgeable in agricultural economics. They have a strong technical background, but they may not be well informed in the specific area addressed by the book you are reviewing. Some people may only scan the Journal's technical articles, but carefully read the book review section for intellectual stimulation or enjoyment.

What do your readers want to know? They may have already decided from the title of the book and the author whether or not the subject is intrinsically appealing or relevant to their professional interests. Some readers may want to keep abreast of new information in their field. If so, reading the book—not the review—is the best way to add to their storehouse of facts. Others may want to know what is being published outside their technical specialty, and they can learn what they want to know from your review without reading the book. A few readers will want your judicious appraisal of whether they should read the book. Is it a landmark study? Is it so well researched or so enticingly pre-

sented that people should examine it, even if its scope is outside their usual area of interest or expertise? Will the author's slant on the subject enlarge or alter their way of looking at some aspect of economics or of the world itself?

After you have conjured up an audience and imagined yourself in your readers' shoes, it is time to focus on the next issue, your *purpose* in writing the review. My purpose here, for example, is to help you write better reviews. To that end, I have highlighted some of the discoveries I made while perusing the book reviews published in the Journal since its first issue. Afterwards, I have listed some ways to help you organize your ideas so your reviews will be easier to write and more enjoyable to read.

What's *your* purpose in reviewing the book? Think of yourself as a broker between the author and the prospective reader. You have a responsibility to discern the nature of the author's major contributions to economics research and to evaluate how well those contributions are communicated. Is your objective to alert the reader to a new research method the author has developed? Do you want to convey information about an area of economics in which little has been published? Does the author present research findings that merit the attention of all agricultural economists or only of specialists? Is the book related to a current topic of public debate? Does it offer new and workable solutions?

To answer these questions, take notes while you read. It helps to include comments and criticisms on: (1) the value of the book and the information it imparts, especially how it compares with other books in the same field, (2) unusual insights or contributions by the author, (3) specific quarrels and quibbles, such as inaccuracies that trip up the author's argument, and (4) an evaluation of the book's best and worst features.

Courtship of the Reader

You need to court the reader. The trick is to start with a hook that will capture the reader's attention. I recommend choosing a title for your review that differs from the title of the book, one that will specifically reflect

Latham is coeditor of *The Journal of Agricultural Economics Research* and the coordinator of the writing workshops of USDA's economics agencies. She thanks Harold Breimyer, Ronald Mighell, and Clark Edwards for their helpful comments.

your point of view as reviewer. Check the book review sections of major newspapers to glean ideas for your own review titles.

Good reviewers know that the *lead sentence* is critical. It should immediately involve the reader in the reviewer's intellectual viewpoint by capturing what is new, unusual, provocative, or even seriously flawed about the book. What responsive chord did the book strike in you? What ideas did it stimulate, or what vital questions did it leave unanswered?

To make your lead sentence dynamic, choose active verb constructions (subject, verb, object) rather than linking or passive ones. An intriguing discovery I made in examining the Journal's reviews was that not only were strong leads essential in stimulating a desire to read the entire review but that, if the lead was weak, the review rarely got better. The high correlation between a captivating lead and a perceptive review was astonishing.

The following examples of Journal leads command the reader's attention:

- To someone suckled on Friday night horse operas and weaned on Saturday afternoon double features, the West is a peculiarly American place. The good guys may not have always won out there beyond the Platte and the Missouri; but they always had flair, and for better or worse, they were what the country was all about (Brewster, Vol. 23, No. 4, Oct. 1971).
- In describing that animal called the political economy of agriculture, all men are blind. But some men are far more accurate than are others in describing the beast (Tweeten, Vol. 32, No. 3, July 1980).
- A question to be asked about the content of any scientific discipline at any time is: What part is temporal, and what part is perennial? (Breimyer, Vol. 33, No. 2, Apr. 1981).

Never begin the first sentence of the first paragraph of your review (or preferably any sentence in your review): "This book discusses. . . ." The opening is ordinary and fails to engage the reader.

Do not begin with an explanation of how a book is organized. Such a technique is elementary, lazy, insignificant (except perhaps to teachers who are thinking in terms of a textbook syllabus), and boring. It is a sure yawner. Whenever possible, avoid mentioning numbers of chapters or sections followed by lengthy catalogs of their contents. Readers generally do not care, and can

rarely remember that part 3 or chapter 7 contains information on x, y, or z topics.

It sometimes works to introduce a paragraph by posing a question—for example, "What are the uses of models, and who are the clients?" (Miller, Vol. 34, No. 2 Apr. 1982) or "Why then haven't the nations of the Atlantic Community been willing to modify agricultural policies toward a less protectionistic, free trade situation?" (Abel, Vol. 19, No. 2, Apr. 1967). Because the author of the book had not answered this question, the reviewer attempted to do so. It is entirely appropriate for the reviewer to step outside the book and offer a professional opinion.

Characteristics of Good and Bad Reviews

Helpful book reviews have several characteristics in common. First, they highlight the book's strengths and weaknesses, that is, what's valuable and what isn't. What is the book's major contribution to the discipline of economics? Which is more valuable, the overview or the specific information? Are any major lessons to be learned? What will you remember about the book? What would you, the book reviewer, like to emblazon on your reader's memory? Does the book do what the author set out to do? Is it carefully reasoned? How might it have been improved? What are its shortcomings or its questionable conclusions? Is the title misleading? Are the data questionable? Does the author have a personal agenda? Does the author rely on a personal account (as in a case study), on primary source material, or on secondary sources? Does the book cover the same terrain as other books in the field? If so, does it do a better job? Is it factual or interpretive?

Second, a helpful review tells what categories of readers will find the book most useful. Readers want to know whether reading the whole book is worth the investment of their time. If not, which portions are most worthwhile, and for whom? Does the reader need to read the entire book in sequence, or can the reader scan, focusing on a few illuminating sections? Because time is always short, a reviewer can add value by steering readers clear of nonessential material. Is the book too long for its scope? Does it ramble? Is it disorganized and inchoate, or is it clear and persuasive? Is the book linear and historical, or is it problematic?

Third, a helpful review tells who needs to read the book. How are most readers likely to use the book? What will specific types of readers—professional economists, graduate students, farmers, consumers, agribusiness people, government policymakers, or political scientists—get

out of it? Which sections will each of them find most illuminating or most tedious?

Fourth, the review suggests how the book differs from others on the same subject. How is it better or worse? If you are familiar with the literature (and you should not be reviewing the book unless you are), you need not fear predicting the effect it will have on your professional colleagues. For example, Cavin says of a book he reviewed:

Although aware of the hazards of economic forecasting, I venture to predict that [it] will prove to be a landmark in the teaching of economics, particularly in those schools where proper emphasis is given to economic history (Vol. 20, No. 1, Jan. 1968).

Fifth, a review is a critique, not a book report or synopsis. It should not chronicle each topic. It should not be a substitute for reading the book, the way some students who are pressed for time may be tempted to use the college outline series for *Moby Dick*. Organize your review around the major ideas in the book—in order of their importance to you, the reviewer, and their likely importance to the reader, rather than around each of the topics in the sequence the author has presented them. Provide the reader with the substance of the book, but do not recap it chapter by chapter. Avoid succumbing to the temptation of taking the easy way out: “Smith’s book is divided into four parts,” followed by the titles of parts 1, 2, 3, and 4 plus a sentence or two about each. Offer the reader more than an embroidered table of contents.

Sixth, if the author has a thesis, tell what it is and whether you agree or disagree. Is the thesis valid? How clearly does the author present it? How well is it defended? What does it ignore? What hypotheses does the author test?

Seventh, do not hedge in your evaluation, for example: “The book does not appear to be satisfactory as a text.” Have the courage of your convictions and state them in a straightforward manner. Likewise, if you say, “In this reviewer’s judgment, . . . ” you will undercut your point. Don’t excuse your judgment as mere personal opinion.

It is much easier to review a book you love or hate than one about which you are lukewarm. However, if you are reviewing a mediocre book, you owe it to your readers to alert them. Here’s an example where the reviewer’s evaluation of a collection of essays was mixed:

The trick is not just to analyze, but to inject imagination and empathy into the analysis and then

communicate the results to the rest of humanity If [the authors] had somehow managed to present their findings in a more satisfactory fashion, they would have turned an acceptable book into an outstanding one (Brewster, Vol. 23, No. 4, Oct. 1971).

Perhaps the book you are reviewing is about a new area in econometrics, one in which the literature is sparse, but the author was hazy, pompous, or tedious. Or perhaps the book is so poorly organized, tiresome, or forbidding that the reader may feel as if in one of those mazes that psychologists use to drive rats crazy. Or, perhaps in an otherwise ordinary book, one chapter is so illuminating that some readers will want to borrow a library copy, but not buy the book. These types of criticisms help the reader.

Special Situations

Proceedings or edited volumes of readings pose special problems. They can be the toughest category of book to review. They can also be the hardest to read. Reviewers are often tempted to mention each chapter or lecture by name, briefly summarizing the topics presented in each. A review that is little more than an annotated table of contents is an olympic bore. Furthermore, the reader cannot possibly assimilate all this disparate information, and will never be able to recall it upon finishing the review. Therefore, it is better to use a separate box to give the authors and titles, if important. (See Hiemstra, Vol. 39, No. 1, Winter 1987.) Then you can concentrate on two or three particularly illuminating, or even controversial, sections. Ask yourself: What is the theme running through the readings? If, for example, you attended the conference where the set of papers was presented, you might begin with some personal reminiscences.

Reasons that collected works are frequently so difficult to review is that they may be flawed by faulty organization, unclear intent, or excessive length. If so, say so. As Breimyer writes in his highly critical, but superb, review of a back-to-back assembly of essays on farm policy: “Collation without critique is a service of uncertain worth” (Vol. 12, No. 3, July 1960).

Biographies, on the other hand, often afford the opportunity for memorable reviews. A reminiscence by a friend, colleague, or student, such as we find in Wilson’s review of the biography of one of his former professors, lends a personal touch and an immediacy that engage the reader (Vol. 1, No. 2, Apr. 1949, p. 66). Biographies also speak to the central issue of all relevant writing: So what? When Sherman reviews Harrod’s biography of John Maynard Keynes, she poses the question that

many of us have asked: "What was the touchstone of [his] great success?" (Vol. 3, No. 3, July 1951). And then she uses the review to answer it.

Matters of Style

At some point, you must direct your attention to the craft of writing—namely, communication (how to use words to express your ideas most clearly) and persuasion (how to enchant your readers sufficiently that they too will see the value of those ideas). The good news is that with discipline this craft can be learned, even by reviewers whose literary gifts are modest. I recommend that, before you write your next book review, you read both McCloskey's book, *The Writing of Economics* (1987), and Colvin and Mighell's article, "Writing as a Tool for Economic Research":

The very nature of economics places an ethical obligation on economists to use the resources of communication more efficiently than others (Colvin and Mighell, Vol. 9, No. 4, Oct. 1957).

Colvin and Mighell offer invaluable tips on writing, including sentence structure, grammar, style, tone, organization, consistency, words to use and not to use, and techniques for editing one's own writing.

Aim for simplicity and clarity, not pedantry. Writers with solid professional reputations rarely try to impress their readers with their sophistication. They do not need to drag in arcane detail to establish their credentials. If an economist has presented concepts the non-specialist may find difficult to comprehend, the reviewer has an obligation to make those ideas comprehensible to all readers of the journal in which the review will appear. As Alport said in the lead to his critical review of *The Language of Social Research*: "If this be the language of social research then teach me, please, a simpler tongue" (Alport, Vol. 8, No. 2, Apr. 1956).

Use the language of ordinary speech. Sundquist criticizes writers of economics for writing "at a level above which many upperclassmen and some graduate students [are] able to comprehend" (Sundquist, Vol. 23, No. 3, July 1971). Therefore, reviewers of books on economics need to establish a natural, not an academic, tone. For example, it is far more straightforward either to say "I think" than "in the opinion of this reviewer" or to simply state the point outright without qualification or apology.

It is generally better in a review to use the author's last name than any of the following: Professor Galbraith, Dr. Galbraith, the author, the book, the volume. It is far stronger to tell the reader: "Galbraith believes. . . ."

than "In the opinion of the author of the book, . . ." Be direct; make the person come alive. Don't try to separate ideas from the individuals who espouse them. Employ active voice constructions, which are more natural and direct, like human speech. A passive sentence, such as "the estimation problem is treated systematically by applying the criterion of maximum likelihood," has several problems (Vol. 3, No. 3, p. 105): it does not tell you who is applying the criterion; it is ungrammatical because of the dangling modifier "by applying"; it is stilted and unnatural.

Use short, simple sentences rather than long, convoluted ones. Mini sentences work well for variation and emphasis. They grab the attention of the reader. For example:

. . . no misunderstanding so impedes farm policy studies as the premise that the problem is singular. *It is not. It is plural.* The farm problem is a price problem, and an income problem, and an excess manpower problem, and a market problem . . . (Breimyer, Vol. 17, No. 1, Jan. 65).

Avoid hackneyed terms. As Mighell and Lane tell us in their article on "Writing and the Economic Researcher:"

Economists sometimes overwork certain words The shock value of using such a word on special occasions is largely lost if it is used all the time (Mighell, Vol. 25, No. 1, Jan. 1973).

Words like "impact," "concern," "aggregate," "methodology," "utilization," and "maximization" are just the kind of economic jargon that reviewers need to beware of.

Use superlatives, adjectives, and adverbs sparingly. As Mighell and Lane point out: "If you overstress every point, your reader will pay no attention when you have something that really deserves stress" (Mighell and Lane, Vol. 25, No. 1, Jan. 1973). When describing a book, limit the use of the following tired, weak, and overused adjectives: interesting, important, excellent, worthwhile, valuable, well-written, and uninteresting. You might instead try these: lucid, dynamic, powerful, dramatic, engaging, provocative, readable, rich in insights, pragmatic, balanced, misleading, or forbidding.

Pay special attention to your use of the demonstrative pronoun and adjective "this," as in "this book," "this idea," or simply (and often mysteriously) "this." Probably no other word in economics writing is so abused. Likewise, eliminate the most trite of all adverbs, "very."

Furthermore, don't introduce sentences with adverbs like hopefully, interestingly, surprisingly, and regretfully. It's far better to say: "I hope," "I found fascinating," or "I was disappointed." Own your reactions to the book you are reviewing without raising them to a universal level.

Have the courage of your convictions. Reviewers have the right and duty to assume professional responsibility for their own judgments:

A special problem for economists in discussions of future events is the tendency to overqualify. The future is uncertain. No one wishes to be caught out on a limb that may break. But it is better to state your assumptions and make forthright statements than to hedge and lose all meaning (Mighell and Lane, Vol. 25, No. 1, Jan. 1973).

Refrain from ending your review with the hackneyed phrase, "in summary," or the stilted comment, "as has been pointed out."

Avoid bibliographies at the end of book reviews because they are pretentious. Try to work the ideas of other authors you examine, quote, or paraphrase into the body of your review. You may occasionally need to use footnotes, but in a review it's best to keep them to a minimum. If you parade your own encyclopedic knowledge of the subject, you are likely to annoy the reader.

The Last Word

Just as reviewers should begin by focusing on their audience, they should end with the same focus.

Let's imagine for a moment a poor, but not atypical, review—namely, the kind you will want to avoid. It might be written in the following manner:

This is an important and interesting book. . . . The author's thesis is that. . . . The author divides the subject into three parts, each with five chapters. . . . Chapter 1 explains. . . . Chapter 15 discusses. . . . As has been pointed out, the author maintains that. . . . In the opinion of this reviewer, the book has several strong points. . . . In summary, economists who work in the area of . . . should read this book.

Frankly, I believe few readers will make it to the end of such a review because their imaginations are not kindled and their professional needs are not met. A good review, in contrast, starts by suggesting what sets the book apart from the ordinary one and how the reader will benefit. The reviewer's last word should underscore the book's enduring value. For example:

No concrete solutions are offered to the problems of economics in Ward's book. The emphasis is on what we as economists ought not to do. But, as he indicates, the first step in correcting any error is recognizing that the error does exist. For this I think Ward can be commended. We do need reminding (Kost, Vol. 25, No. 1, Jan. 1973).

Many readers go through books such as this one seeking inspiration to formulate variations of their own . . . to tackle immediate problems of their own requiring application of advanced optimization techniques in quantitative economics models. If you are one of those readers, I recommend this book to you as a source of insights into variations of conventional textbook treatments (Edwards, Vol. 22, No. 4, Oct. 1970).

If the next time you write a book review you examine the questions posed here and reflect on the ideas suggested, you will find the craft of reviewing easier. And I think your readers will find your review both livelier and more informative.

Reflections on Communication in Agricultural Economics

Harold F. Breimyer

Agricultural economists are not wont to wearing sack-cloth and ashes. Rarely do they admit shortcomings publicly. Nor should they. To their credit, though, they make one exception. They admit freely that as individuals and as a profession they struggle with sins of omission and commission in communicating their ideas.

The concern is warranted. The subject matter of economics does not lend itself to easy, clear communication. Economics is, after all, an exercise in abstraction. The human intellect has a materialistic bias. It grasps and conveys information about the material world more readily than about the conceptual.

So it is that most agricultural economists, in my observation, labor hard as they try to convert their ideas to understandable prose. Despite their efforts, success ratios differ. Anyone who reads the *American Journal of Agricultural Economics* or, for that matter, *The Journal of Agricultural Economics Research* will attest to variability in quality of writing.

The importance of effective writing is not disputed. Most of the recognized giants in agricultural economics have been talented writers. From my early career years I remember John D. Black. He had an advantage, having been first an instructor in English. John Kenneth Galbraith made the ascent from cow college animal science student to agricultural economist and to distinguished economics professor at Harvard University as much on the basis of his distinctive and appealing writing style as on the brilliance of his ideas. Frederick Waugh, a distinguished scholar, was a superb writer. Theodore Schultz is of the same genre.

To what degree, and by what means, can effective writing in economics be taught?

In the *Journal* for Spring 1987, Judith Latham reviewed a book written by Donald N. McCloskey that addressed the subject (*The Writing of Economics*). Reading Latham's excellent review gave rise to these reflections.

The starting point for any self-instruction on writing might be called strategic. Who is in charge? Latham quotes McCloskey's eminently correct answer. The reader is "sovereign." How often does an author defend himself in terms of the factual accuracy and grammatical correctness of his writing! How often is his defense irrelevant! If potential readers do not understand what the author has written, the score for him is the same as for a football team that fails to put the ball in the end zone.

During my tenure in the U.S. Department of Agriculture, episodes of training sessions on writing came as regularly as United Way campaigns. Some instructions were excellent. Others were marred by reliance on statistical tests: length of sentence, frequency of polysyllables, and so on. Statisticians and mathematicians may be taking over most of the world, but they never can intrude effectively on the art of communication. Clarity of ideas, exactness in word choice, and conformity to rules of language are the essence of communication. They are outside the range of numbers.

Theodore Roosevelt is said to have written a page-long sentence that was clear. Six short sentences of jumbled thoughts can be jabberwocky.

Confine oneself to short, simple words? Of course not! If a long word gives the precise meaning the author wants to convey, use it. For my part, on the average I teach my readers two new words, usually long ones, per paper. Maybe someone reading this article will look up jabberwocky.

Chief mentors of my early days were the divine Caroline Sherman of the Bureau of Agricultural Economics and T. Swann Harding of USDA's Office of Information. Sherman stressed, next after orderliness of ideas, a variety of style. Make some sentences short, others longer, she said. Invert subject and predicate occasionally. She would invariably look at opening words of successive paragraphs. If they were of stereotyped style, out came her blue pencil.

One counsel of Harding has always stayed in my mind. For creative writing, he advised, "Don't force it." If

The author is professor emeritus, University of Missouri-Columbia.

today the author's mind is blank, go fishing and hope for better tomorrow. Creativity comes in spasms. Currently I write a weekly newspaper column. One ready-to-print copy is kept in reserve, lest on the deadline day my mind be blank.

Latham quotes McCloskey regarding writing rough drafts early. It's a sage precept. Bushrod Allin of BAE went a step further. When no more than halfway through a manuscript, write the summary. Such was his instruction. The practice is remarkably effective in helping give what my English teachers begged for, namely, unity, coherence, and (proper) emphasis.

Most of us who put words on paper have favorite *bêtes noires*. Among mine is the practice of opening a sentence with "There is (or are)." There are six reasons for. . . . No, six reasons go far to explain. . . .

Another aversion of mine is excessive use of superlatives, particularly "very." The English language is replete with adjectives and adverbs of magnitude or intensity. They should be used.

Finally, two more admonitions and a promise. Of the former, the first is to be willing to strike out, discard, and start over. For doing this, word processors are a marvelous aid. They are a marked improvement over scissors and stapler. Secondly, rely on Roget. His *The-saurus* is invaluable. I am on my third copy. The first two fell apart.

And the promise. It's the satisfaction that comes from having produced, after false starts and some travail, a composition that is a pleasure to read. It's not vanity to like what one has done and to find gratification in one's own literary handiwork.

J o u r n a l o f A G R I C U L T U R A L E T H I C S

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There is increasing concern about ethical and value issues associated with agriculture. This new journal provides a forum for discussion of the wide range of questions rising from ethical concerns in modern and future agriculture. Thoughtful work relating to ethical responsibilities of agricultural producers and professionals, moral and social assessment of technological changes influencing farmers, costs and benefits of intensive agriculture, agro-ecology, ethical concerns regarding biotechnology and gene manipulation, government intervention, professional codes of ethics, etc., would all fit within the scope.

Selection of Papers

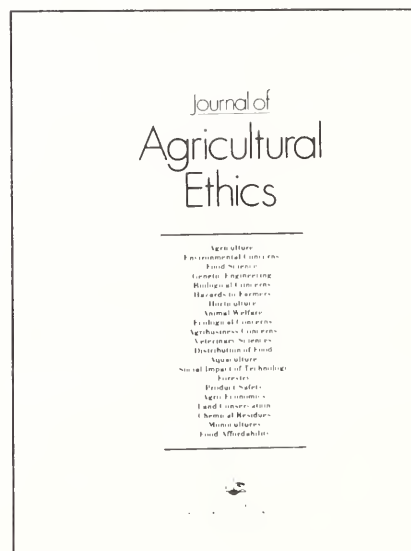
Ethics in Agricultural Research, **Paul B. Thompson** · Agriculture, Ethics, and Restrictions on Property Rights, **Kristin Shrader-Frechette** · Collective Action and the Traditional Village, **Daniel Little** · Agroecology in Context, **J. Baird Callicott**.

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Book Reviews

Update on Math Programming

Mathematical Programming for Economic Analysis in Agriculture. By Peter B.R. Hazell and Roger D. Norton. New York: Macmillan, 1986, 400 pp., \$42.50.

Reviewed by Robert M. House

Agricultural economics contains a rich tradition of mathematical programming; but until Hazell and Norton's book, there had been no thorough compendium of the most interesting developments in the past 15 years. Their book is a self-contained reference to programming modeling: linear programming (LP) theory and computer solution, farm modeling techniques, sector modeling techniques, and policy applications.

The book blends theory and practice. The discussion of farm and sector models and applications is illustrated with tableau fragments (tables containing a small rectangular block of the coefficients from a few rows and columns of an LP model). The book is aimed at the graduate student level. Knowledge of intermediate microeconomics is assumed. The reader should understand linear algebra and some calculus. Hazell and Norton cover topics quickly and give interested readers references to more comprehensive treatments of many subjects. The reference list is thorough for an intermediate text.

Using a simple farm model as an example, the authors discuss the assumptions of linear programming and briefly introduce duality, Lagrangean functions, and Kuhn-Tucker conditions. They illustrate ways to solve an LP problem graphically and take the obligatory walk through several iterations of the Simplex algorithm. Then the discussion of farm modeling techniques begins in earnest. They discuss production activities, focusing on factor substitution, input/output response relations, crop rotation, and joint products. They briefly cover input and resource issues. A chapter on advanced farm modeling topics introduces single and multiperiod investment, consumption, work/leisure preferences, and multiple goals.

The farm modeling discussion is excellent. Topics are well covered. The material progresses from the simple to the more complex, and there are plenty of practical tips and real-world know-how. As an introduction to farm modeling, the book is a good update of Beneke and Winterboer.¹ The book focuses on farm model components that are used in sector models; it does not cover farm simulation in sufficient detail to address, for example, machinery sizing/purchase decisionmaking or financial and tax planning.

The strength of Hazell and Norton's book is sector modeling. The authors explain how the agricultural sector presents a multilevel decisionmaking problem. That is, at an upper or sectoral level, officials make policy decisions, trying to achieve national or social objectives. At the lower or microeconomic level, producers independently make individual decisions, attempting to achieve their objectives, given market, resource, technology, and policy conditions. There exists no algorithm that solves the multilevel problem directly, so most sector models do not try to maximize a set of policy objectives, but focus instead on simulating how producers respond to alternative policies and other conditions. Researchers analyze policy by simulating sector response under alternate policy scenarios.

The treatment of sector model topics is thorough. Hazell and Norton discuss the standard fare: selection of representative production units, aggregation, input supply and output demand markets, regional markets, processing, and onfarm consumption. They include more sophisticated topics such as departures from competitive markets and approaches to handling cross-price effects. The standard sector model generally omits the response of demand to income changes and, therefore, provides only partial equilibrium impacts to policy changes. Hazell and Norton explain how to link demand to income and augment a sector model to yield general equilibrium responses.

There is no recipe for constructing a first-rate sector model; good modelers are competent in many areas and

The reviewer is an agricultural economist with the Agriculture and Trade Analysis Division, ERS.

¹ Raymond R. Beneke and Ronald Winterboer, *Linear Programming Applications to Agriculture* (Ames: The Iowa State Univ. Press, 1973).

improve their skills through practice. Based on considerable experience, Hazell and Norton give us valuable insight on how to construct and validate sector models. They offer tips on calculating and estimating coefficients. Occasionally they make philosophical observations:

Building an applied model is a process, and the most successful models evolve through time to take into account new findings. There is never a definitive version, but rather at any moment in time the model represents a kind of orderly data bank that reflects both the strengths and limitations of the available quantitative information (p. 272).

There is value in keeping models small. One important lesson for model developers is that "sponsors of the effort are likely to lose interest if they have to wait 1 or 2 years for the first results." Even before a sector model is ready for use, much useful partial analysis can often be done with the assembled data.

Hazell and Norton draw a small sample from the set of actual sector models to illustrate applied policy analyses. The examples are organized around policy issues such as questions of comparative advantage, input and output pricing policies, and evaluation of investment project alternatives. Agricultural policymaking is complicated because policies have multiple objectives. One approach is to use the sector model to construct policy feasibility frontiers that show the tradeoffs among two or more objectives (such as foreign exchange and sector income) under different combinations of policy instruments.

Risk is a major concern; it is the topic of separate chapters in each of the book's sections on farm, sector, and policy analysis. Hazell and Norton discuss risk in terms of expected utility, and they offer several approaches to modelling risk: mean variance (E, V), mean standard deviation (E, σ), and MOTAD (minimum of total absolute deviation). Sector-level risk modeling receives thorough treatment. Hazell and Norton present both price and revenue expectations models of risk, and they describe how objective function formulations will differ in each case.

The risk discussion is essentially the current state-of-the-art in farm-sector modeling. I have used the same techniques, and they leave much to be desired. Researchers on risk, such as Newbery and Stiglitz² and Weiss³ have demonstrated that there are major problems with the mean-variance formulations of decision-

making under uncertainty. Some risk modelers have addressed these concerns. Lambert and McCarl, for example, proposed a direct expected utility maximization (DEMP) formulation which has "fewer controversial assumptions."⁴ Improved applied techniques for modeling risk have not yet been widely adopted.

One aspect of the book that strikes me as being less forward-looking than it should be is the emphasis on linearization. There is a historical reason for this shortcoming. Although Enke and Samuelson in the early fifties devised a way to formulate spatial competitive equilibrium as a problem of maximizing producer and consumer surplus, some 20 years passed before practical linear programming formulations of the problem were published. Regional models had yielded only approximate solutions, and they required cumbersome iterative procedures. There was a breakthrough in 1973, when Duloy and Norton published an efficient linear approximation formulation with which some problems could be accurately solved with commonly available LP solvers.⁵ A small flood of farm-sector models followed that employed this technique. However, the grid linearization innovation now influences model formulation more than it deserves. Excellent large-scale, nonlinear solvers such as Minos⁶ have been available to mathematical programmers since 1977, but Hazell and Norton dismiss nonlinear solutions (p. 3) and focus their energy on how to linearly approximate inherently nonlinear relationships. At one time these formulations were a necessity, but now it is simpler and more straightforward to solve most nonlinear relations directly in math programming models. It is true that solving a nonlinear problem sometimes requires more computer time than solving the linear approximation to it, but computer time becomes less expensive every year. And, with current solvers, as problem size and the number of nonlinear functions expand, the nonlinear solver may give out and a linear approximation route may become the only feasible approach. However, the nonlinear approach is simpler, is more straightforward to formulate, helps keep our models small, and is quite workable for most problems. In the Economic Research Service, we routinely solve the USMP Regional Agricultural Model with several hundred nonlinear variables. Using grid linearization would add several hundred equations and well over 1,000 variables to this model.

⁴ David K. Lambert and Bruce A. McCarl, "Risk Modeling Using Direct Solution of Nonlinear Approximations of the Utility Function," *American Journal of Agricultural Economics* (Vol. 67, No. 4, Nov. 1985), pp. 846-52.

⁵ John H. Duloy and Roger D. Norton, "CHAC, A Programming Model of Mexican Agriculture," *Multi-Level Planning: Case Studies in Mexico*, ed. Louis M. Goreaux and Alan S. Manne (Amsterdam: North-Holland Publishing Co., 1973), pp. 291-337.

⁶ Bruce A. Murtagh and Michael A. Saunders, *Minos 5.0 Users Guide*, Technical Report SOL 83-20 (Stanford, CA.: Systems Optimization Laboratory, Dept. of Operations Research, Stanford Univ., Dec. 1983).

² David M.G. Newbery and Joseph E. Stiglitz, *The Theory of Commodity Price Stabilization* (Oxford: Clarendon Press, 1981).

³ Michael D. Weiss, *Conceptual Foundations of Risk Theory*, TB-1731 (U.S. Dept. of Agr., Econ. Res. Serv., 1987).

The book is an important update on advances in farm and sector mathematical programming practice since 1970. The treatment of most topics such as risk, grid linearization, and cross-price effect formulation is traditional, which is no surprise because Hazell and Norton were often the theoretical and/or applied innovators and they established the traditions. I must criticize the book mildly because it covers less than it ought to. Its emphasis is on agricultural sector modeling that grew out of work of the Development Research Center of the World Bank in the seventies. Work outside this tradition

is sometimes ignored. For example, the formidable difficulties of estimating coefficients of risk aversion are recounted, but Paris' suggestions on estimating risk aversion parameters from historical data are overlooked.⁷ But I am willing to forgive such modest failings because of what the book does cover and because it is so well written. I found it rewarding to read, and I strongly recommend it.

⁷ Quirino Paris, "Revenue and Cost Uncertainty, Generalized Mean-Variance, and the Linear Complementarity Problem," *American Journal of Agricultural Economics* (Vol. 61, No. 2, May 1979), pp. 268-75.

Journal of Agricultural Economics	
VOL. XXXVIII, No. 3	September 1987
No Fixed Address: Presidential Address, <i>A. K. Giles</i> World Agricultural Trade and the New Gatt Round, <i>G. W. Reeves</i> The Common Agricultural Policy: The Implications for Italian Agriculture, <i>S. Tarditi</i> The Provision of Carbohydrates for the European Community's Biotechnology and Chemical Industries, <i>S. A. Harris</i> Income Elasticities of Demands for Foods in Great Britain, <i>A. Chesher and H. Rees</i> Models of Resource Allocation in Public Agricultural Research: A Survey, <i>G. Fox</i> Interpersonal Variation in Farm Workers' Earnings: Analysis of Wages and Employment Enquiry Data, <i>J. C. Philpott and G. J. Tyler</i> Conjoint Measurement in Ham Quality Evaluation, <i>J.-B. Steenkamp</i> Agricultural Contractors: Some Survey Findings, <i>R. M. Ball</i> Price Relationships for Beef in Smithfield Market, <i>J. A. Murphy, J. J. O'Connell and S. Quinn</i> Price Expectations Formation and Revision in the Nerlovian Framework with Application to Nigerian Farmers, <i>D. O. A. Phillip and G. O. I. Abalu</i> The Developing Framework for the Economic Evaluation of Forestry in the United Kingdom—A Comment, <i>C. Price</i> —A Reply, <i>E. Kula</i> Dairy Structure and Milk Price Comparisons — A Comment, <i>E. Pitts, M. Haines and T. N. Jenkins</i> —A Rejoinder, <i>R. E. Williams</i> Reviews and Publications Received The Agricultural Economics Society Programme of Conference, 1987 Minutes of AGM Constitution Index to Volume XXXVIII	
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The Future of Food Demand

Food Demand Analysis: Implications for Future Consumption. By Oral Capps, Jr., and Benjamin Senauer (eds.). Sponsored by the S-165 Southern Regional Research Committee and the Farm Foundation. Blacksburg, VA: Virginia Polytechnic Institute and State University, 1986, 292 pp., \$15.00.

Reviewed by Laura Ann Blanciforti

Two criteria are critical in judging empirical studies of demand: Do they provide a new understanding of the structure of demand? Do they furnish usable results for decisionmakers? Judged by the second criterion, this volume of articles only partly succeeds. Judged by the first criterion, the paths the authors follow are frequently familiar, although their studies do provide considerable insight. Basic to such analyses are the type and quality of data, the model specification, interpretation of results, and other empirical and theoretical problems.

Most of the leading researchers of food demand in the agricultural economics profession are represented among the 14 authors and 3 commentators. The collection of articles summarizes a 6-year effort by the Southern Regional Research Project (S-165). The S-165 project focuses on food demand analysis produced by members of U.S. land-grant college experiment stations. Editors Capps and Senauer present a seemingly coordinated research effort by the project members to develop a more complete theoretical and empirical analysis of food demand. The committee members believe that the structure of food demand is complex and knowledge about it is still far from complete. The work of refinement and improvement must continue for food demand analysis to be relevant.

The articles attempt to meet two objectives of the S-165 committee. The first objective is to investigate alternative analytical and theoretical models of household expenditures, consumer demand, and nutritional intake. The second is to investigate different ways of collecting

The papers include: (1) "Market Demand Functions" by S.R. Johnson, Richard D. Green, Zuhair A. Hassan, and A.N. Safyurtlu; (2) "Global Behavior of Demand Elasticities for Food: Implications for Demand Projections" by Michael K. Wohlgenant; (3) "Food Expenditure Patterns: Evidence from U.S. Household Data" by Chung L. Huang and Robert Raunika; (4) "Projecting Aggregate Food Expenditures to the Year 2000" by Kuo S. Huang and Richard C. Haidacher; (5) "Discussion" by Joseph Havlicek, Jr.; (6) "Implications of Factors Affecting Food Consumption" by Robert Raunika and Chung L. Huang; (7) "Is the Structure of the Demand for Food Changing? Implications for Projections" by Reuben C. Buse; (8) "The Effects of Household Size and Composition on the Demand for Food" by David W. Price; (9) "Role of Integrated Decision Theory in Considering Future Food Consumption Patterns of the Elderly" by Dorothy Z. Price; (10) "Effects of Increasing Elderly Population on Future Food Demand and Consumption" by Ronald A. Schrimper; (11) "Comments: Food Demand Analysis: Implications for Future Consumption" by Lester H. Myers; (12) "Population Scale, Composition, and Income Effects on Per Capita and Aggregate Beef Consumption: A Temporal and Spatial Assessment" by Patricia K. Guseman and Stephen G. Sapp; (13) "Orange and Grapefruit Juice Demand Forecasts" by Mark G. Brown and Jong-Ying Lee; (14) "Analysis of Convenience and Nonconvenience Food Expenditures by U.S. Households with Projections to the Year 2000" by Oral Capps, Jr., and Joanne M. Pearson; (15) "A Systematic Analysis of Household Food Consumption Behavior with Specific Emphasis on Predicting Aggregate Food Expenditures" by James C.O. Nyankori; (16) "Implications For Food Demand of Changes in Competitive State within Marketing Channels" by Barry W. Bobst; and (17) "Food Demand Analysis (Discussion)" by Joseph C. Purcell.

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and using current and new data sources on food consumption and nutritional intake.

The articles are grouped into three major sections, each of which is followed by a commentary. The first section addresses methodology. It reviews the foundations of demand analysis and some of the relevant statistical tools. The second section explains food consumption patterns in terms of economic and sociodemographic characteristics; it also includes information on the elderly. The third section considers specific classes of food (beef, citrus, and convenience foods), optimal resource allocation, and market structure.

The first section focuses on understanding the structure of demand. Johnson and others and C. Huang and Raunikaar present a somewhat classical version of demand research. Both sets of authors present demographic scaling and translating as ways to understand changes in demand structure. Huang and Raunikaar utilize survey data and group households by region and degree of urbanization. Johnson and his colleagues do not conduct any new empirical analysis. They coordinate and review theories, methods, and estimates from other studies.

In contrast, Wohlgenant and K. Huang and Haidacher provide two nonconventional approaches to demand analysis. Wohlgenant describes one of the frontier areas of demand research. Huang and Haidacher refuse to ignore the supply side, as is done by most economists in demand research. Wohlgenant focuses on the Fourier model, a flexible functional form only recently applied to demand analysis. He addresses some of the problems associated with satisfying the theoretical restrictions of consumer behavior and with making stable and unbiased elasticity projections. And, using Taylor series expansions, he presents simulation results for 1978-82.

Huang and Haidacher briefly review the theory of budget allocation and the effects of past supply, which helps us understand the market mechanism that consumers face. Their principal contribution is to establish a block recursive equilibrium model of food consumption. They model the market mechanism faced by consumers for three commodity groups: food at home, food away from home, and nonfood. They use quarterly time series data and make estimates to the year 2000.

The authors in the second section focus on the implications of demand structure for forecasting. Buse emphasizes the changing structure of demand. He uses the 1972-73 Bureau of Labor Statistics' (BLS) Consumer Expenditure Survey (CES) and the 1977-78 U.S. Department of Agriculture's (USDA) Nationwide Food Consumption Survey (NFCS) to estimate the change in

structure over time. Buse first estimates expenditures using a two-equation empirical model. He then disaggregates the effects of changing demand structure between the two survey periods into components accounting for population shifts, budget share changes, and other economic and demographic changes. His study highlights the problem of analyzing data from two different sources. The methodology is interesting, but the results could be strengthened by an update to a more recent period.

Both D.Z. Price and Schrimper focus on one population group, the elderly. Price applies psychological techniques to the understanding of nutrition and food consumption behavior of the elderly. A special survey of households in the Northwest was conducted (although the time frame of the survey is not given). Price's study is a refreshing approach to a difficult problem, and also meets both committee objectives. Additional empirical work and insights into individual differences in food consumption are sorely needed.

Schrimper's study is a nonmethodological, nontheoretical presentation of the evidence on food consumption behavior. He summarizes findings from the 1972-73 and 1980-81 CES and the 1977-78 NFCS to explain the expenditure behavior of the 55-and-older age groups for away-from-home food items.

In the third section, the authors show an interest in examining modern society with its increase in two-worker households and its desire for more leisure time. The authors of this last section include variables to represent female labor force participation, the use of convenience foods, and childless households.

The articles represent a thorough review of the current status of agricultural economic research in food demand. Many of the researchers use cross-sectional data from the CES and the NFCS. They use population data from the Census Bureau to supplement results and, in some cases, to make projections. Their studies are designed to explain household food spending and consumption patterns.

The editors make these reports accessible to researchers and newcomers to food demand analysis. Their volume is, thus, a convenient guide for students of food demand. However, students will have to delve deeply to find what they need. For researchers the book highlights many areas of inquiry both theoretical and empirical.

The book does show that food demand analysis is still far from complete, and it provides a good set of references from which to build. Understanding and integrat-

ing existing theories and methods and developing new approaches need to continue.

As with most regional research projects, the means became the end. No one methodology is portrayed as the best approach, and no definitive answers are given. Each chapter could stand alone as an incisive and persuasive piece of research. Yet, a book was created! A book was created in which readers are presented with an impressive array of analysis and which provided a foundation for understanding the structure of demand.

My main criticism is that the book should be made more useful to decisionmakers. Of course, the structure of demand needs to be understood before projections can be made. But the information researchers find today generally proves to be the best indicator of the future. Many studies use cross-sectional data, presenting a portrait of demand behavior at a specific point. Most of these surveys were conducted prior to 1980 and are used here to forecast consumption to the year 2000. The

results should have been updated; a presentation of the most recent picture of consumer behavior would be more valuable to decisionmakers in making forecasts.

A fundamental weakness of the book is that it does not tie the research pieces together. How would a decisionmaker use the results? For example, can one relate the average annual expenditure shifts in total food, food at home, and food away from home in Huang and Haidacher's study to those in Buse's study? Can Buse's results be related to Nyankori's? What have we really learned about changes in food-spending behavior? How do we know the analysis is usable?

The book portrays the members of S-165 as a diverse group of researchers working on their own special interests. Their knowledge, experience, and expertise are impressive. They have provided a wealth of empirical material on food demand research. Future research might well emphasize the usefulness of the results and their implications for decisionmakers.

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Sub-Saharan Food Crisis Revisited

Food in Sub-Saharan Africa. By Art Hansen and Della E. McMillan (eds.). Boulder, CO: Lynne Rienner Publishers, Inc., 1986, 410 pp., \$38.50 (cloth), \$14.95 (paper).

Reviewed by Francis Urban

Sub-Saharan Africa has changed in the past 25 years from a net exporter to a net importer of food and agricultural products. Farmers are poorer now, and most farming is at the subsistence level.

Meanwhile the region's population is increasing at an average annual rate of over 3 percent, adding about 15 million people each year. Agricultural land is marginal at best. The Sahel loses farmland to creeping desertification at a rate that may be as high as 8 million hectares per year, the result of overgrazing and overcultivation. Two serious famines devastated the region in 1973-74 and 1984-85. The region has a crushing foreign debt of nearly \$200 billion, beyond its capacity to repay, and servicing the debt can be done only at the expense of an already poor physical infrastructure.

One would think the region might rivet the attention of the international community. But such is not the case. A number of publications deal with individual countries or problems, but few scan larger horizons. Hence, this volume, dealing with the broad food problem in the region as a whole, is a welcome addition. One should probably read it with L. Timberbacker's *Africa in Crisis* (London: 1985).

Food in Sub-Saharan Africa had its origin in the annual Spring Seminar on Africa and Food Issues, begun in 1983 at the University of Florida's Center for African Studies. It represents a multidisciplinary approach to dealing with such a large issue. Of 31 authors, 8 are agronomists or zoologists, 7 anthropologists, 5 economists, and 3 historians. Other disciplines include political science, meteorology, geography, forestry, and nutrition. Most of the authors are university professors; 6 are scientists with the World Bank, the Agency for Inter-

The papers include: (1) "Overview: Food in Sub-Saharan Africa" by Della E. McMillan and Art Hansen; (2) "Food as a Focus of National Regional Policies in Contemporary Africa" by S.K.B. Asante; (3) "The Political Economy of Food Issues" by René Lemarchand; (4) "Agricultural Development Ideas in Historical Perspective" by John M. Staatz and Carl K. Eicher; (5) "Social Science Perspectives on Food in Africa" by Sara Berry; (6) "The African Environment" by Charles Guthrie; (7) "Climate, Drought, and Famine in Africa" by Sharon E. Nicholson; (8) "Subsistence Strategies and Systems of Land Use in Africa" by Daniel McGee; (9) "Traditional Social Formations" by Ronald Cohen; (10) "Agriculture, Food, and the Colonial Period" by R. Hunt Davis, Jr.; (11) "African Soils: Opportunities and Constraints" by Hugh Popenoe; (12) "Major Domesticated Food Crops" by Clifton Hiebsch and Stephen K. O'Hair; (13) "Livestock in the Economies of Sub-Saharan Africa" by James R. Simpson and Robert E. McDowell; (14) "Undomesticated Animals and Plants" by Michael E. McGlothlen, Paul Goldsmith, and Charles Fox; (15) "Postharvest Considerations in the Food Chain" by Robert P. Bates; (16) "Fuelwood" by Olivia Webley; (17) "Distribution of Resources and Products in Mossi Households" by Della E. McMillan; (18) "Meeting Human Nutritional Needs" by Patricia A. Wagner; (19) "The Role of International Agricultural Research Centers in Africa" by Donald L. Plucknett, Nigel J.H. Smith, and Robert W. Herdt; (20) "Farming Systems Research and Extension: An Approach to Solving Food Problems in Africa" by Louise O. Fresco and Susan V. Poats; (21) "Women Farmers and Food in Africa: Some Considerations and Suggested Solutions" by Anita Spring; and (22) "Prospects for Long-Term African Changes: Lagos Plan of Action Versus the Berg Report" by Robert S. Browne and Robert J. Cummings.

The reviewer is an agricultural economist with the Agricultural and Trade Analysis Division, ERS.

national Development, or research institutions; and 4 are graduate students. All worked, or are currently working, in Africa. Only one of them is an African, S.K.B. Asante, a well-known Ghanaian political scientist.

In part one, political scientists and economists provide an overview of the problem at the level of policy and theory. Asante introduces the concept of food policy and discusses policy responses to food crises. He considers the overvaluation of national currencies as particularly detrimental to food production in Africa. Staatz and Eicher also review the evolution of agricultural development economics in the past four decades.

Part two discusses the environmental and human background of the African food problem. The authors are historians, anthropologists, and a meteorologist. Most of the discussion is introductory and general, useful to those who are not particularly familiar with Africa. Nicholson's paper, however, is of particular interest because she maintains that droughts are an inherent characteristic of the African environment; they occur at fairly predictable intervals and should, therefore, be included in the planning process.

Part three is again basic and technical, covering soils, major crops, livestock industry, and undomesticated animals and plants. The authors may be overemphasizing the importance of wild animals and plants as a source of food, since large parts of Africa are already overcrowded and land is increasingly scarce.

Part four deals with post-harvest technology, food distribution, nutrition, and fuelwood. It contains articles on subjects not often dealt with in economic and development literature. McMillan rightly questions the usefulness of the household concept as the basis for eco-

nomie planning and suggests that wider groupings, such as the tribe, should be the basic unit in some cases.

Part five discusses the ways Africans and international development agencies are searching for solutions to the African food crisis. It focuses on the role of international agricultural research centers, farming systems, research and extension, women in farming, and prospects for future changes. Its rather obvious conclusion is that Africans and their initiatives should be the basis for the solution of the African food crisis as well as for progress on the continent in general.

The book does not completely escape the problems of a conference proceedings. It lacks a clear focus and the articles are often uneven. The editors seem to expect too much from an interdisciplinary approach to the African food problem. But if this approach is chosen, the discussion should be enlarged to include topics such as the high rate of population growth, continuous civil unrests and wars, and resulting massive refugee movements within and among countries. Such conditions help create intractable food, medical, and political problems. A chapter tying the state of development of regional physical infrastructure to food production would also be welcome.

The stress on the colonial experience of Sub-Saharan Africa as a cause of current food crisis seems somewhat overdone, particularly in Davis' articles.

The book is extremely useful, even if the treatment of some topics is rather basic. All those interested in Africa and in economic development issues should examine it. Hansen and McMillan have done an excellent job editing the articles and presenting their overview. The extensive references section and suggested readings enhance the book's value as a guide to African and food issue studies.

In Earlier Issues

If the proposed annual sample census is limited to general-purpose sampling, even a national sample as large as 400,000 farms would not solve the problem of adequately sampling these 60 to 70 populations of specialized producers which require special-purpose sampling. Nor would it solve the problem of increasing the accuracy of State estimates of major crop and livestock items in those States in which the production of those items is geographically concentrated.

Charles Sarle
Vol. 1, No. 4, Oct. 1949

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